DISSERTATION

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# *The Cost of Class Size Reduction: Advice for Policymakers*

*Robert E. Reichardt*

***RAND Graduate School***

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*This document was prepared as a dissertation in August 2000 in partial fulfillment of the requirements of the doctoral degree in policy analysis at the RAND Graduate School of Policy Studies. The faculty committee that supervised and approved the dissertation consisted of Dominic J. Brewer (Chair), Albert P. Williams, and Robert J. Lempert.*

# ABSTRACT

Class-size reduction (CSR) in California was a popular, rapidly implemented reform that improved student performance. This dissertation provides information to state-level policy makers that will help them avoid two implementation problems seen in California's CSR implementation. The first problem was with flat, per student reimbursement scheme did not adequately cover costs in districts with larger pre-CSR class-sizes or smaller schools. To help policy-makers understand the relationship between existing conditions at schools (enrollment, existing class size), policy choices (class-size goal, class size measurement mechanism), and costs four simple "rules of thumb" were created through analysis of a simulation of CSR in seven Florida school districts. At a classroom cost of $53,000, the "rules of thumb" per student cost for CSR is a $435 for reduction to 20, double for reduction to 17 and triple for reduction to 15 when existing class size is 24. The price moves up or down $80 for each change in existing class size above or below 24. Setting the class size goal as a hard ceiling instead of allowing rounding increases costs by about $240 at enrollment of 100. This extra cost declines as enrollments increase to 350 where costs are remain about $30 higher. Schools with enrollments under 100 face costs that are 5% to 10% higher. These "rules of thumb" and three other reimbursement strategies are evaluated for their ability to adequately estimate reimbursements for the cost of CSR. The strategy used in California, of a flat per student reimbursement, was the least efficient. Strategies using district information on costs, class sizes, and enrollments are adequate for reimbursing districts. The "rules of thumb" was the most robust strategy for reimbursing schools. A second problem seen in California was a decrease in the qualification level of the kindergarten through third teacher workforce. The largest decrease were in schools with higher concentrations of low-income or minority students. Modeling of the flow of K-3 teachers during the first year of CSR shows within district transfers create more vacancies in schools with more black or Hispanic students. These vacancies were then more likely to be filled with unqualified teachers. Potential policy responses to this problem are to not fill classrooms created by CSR with transfer teachers, and to provide incentives for teachers to remain in schools that are difficult to staff.

# CONTENTS

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# INTRODUCTION

Class size reduction (CSR) is a simple, easy to communicate school reform policy that is popular with parents, teachers and principals. A 1999 NPR/Kaiser Family Foundation/Kennedy School of Government[1] poll found that class size reduction was one of the reforms that three-quarters of Americans were willing to raise their taxes by $200 to implement. An earlier statewide survey in California found that among parents of third graders, those with children in smaller classes were more satisfied with nine out of ten different aspects of the education program. Among California elementary superintendents and principals, a majority believed CSR had contributed to other reform efforts by boosting teacher enthusiasm and by bringing in teachers with new ideas that enhanced reform efforts. Teacher unions often support class size reduction. In the years before California's CSR program, teacher unions were vocal in their support of smaller class sizes (Bohrnstedt & Stecher, 1999).

This broad enthusiasm makes CSR a relatively easy program for state and federal politicians to support. Parents understand what occurs when the reform is enacted and can verify that something has actually changed in their children's educational process. The Education Commission of the States (ECS) reports CSR efforts in at least 20 states taking a wide variety of forms. Table 1.1 summarizes the reforms by class size goal.

**TABLE 1.1 STATES WITH CLASS REDUCTION POLICIES**

| Class Size Goal | States |
|---|---|
| **Unspecified** | UT, VA, WI, IL |
| **Greater than 20** | NC, SC |
| **20** | CA, FL, IN, LA, OK, TX, MD |
| **18** | AL, ME, IA |
| **17** | TN |
| **15** | SC, NV, RI |

Source: ECS (1999)

CSR was rapidly implemented in California during the summer of 1996 with positive results in student performance. In three years the average K–3 class size for students went from over 29 to just under 20. The evaluation of CSR found students in reduced classrooms consistently had higher performance on standardized tests (Bohrnstedt & Stecher 1999, Stecher & Bohrnstedt 2000).

[1] See http://www.npr.org/programs/specials/poll/education/education/front/html

Yet there were also several key problems with how CSR was implemented in California. First, the state reimbursed schools a flat amount per student sitting in a reduced classroom regardless of the actual cost of CSR in that school or district. Districts with an average class size of 20, where the cost of CSR was practically zero, received the same reimbursement as districts where the average class size was 30 and the cost of CSR was very high. The end result was that CSR was a financial boon for some districts and a financial bust for others (Hill, 1997). A second problem regarded the distribution of qualified teachers. As predicted by several analysts (Bohrnstedt & Parrish 1998, Ross 1999), CSR is associated with a significant decline in teacher qualifications and with larger decreases in teachers in schools that serve high proportions of low-income or minority students.

This dissertation provides state-level policymakers with the information to avoid some of the problems seen in California's CSR implementation. The analysis includes a simulation of CSR in seven Florida school districts and analysis of changes in the teacher workforce during CSR implementation in California. Florida school districts are used for the simulation because of the quality of available data. California data is used to analyze the effects on the teacher workforce because California's program is currently the largest and most extensive CSR program.

This work begins with two chapters that place CSR policies in a context of a changing system for funding and allocating resources for K–12 education. Chapter 1 reviews existing knowledge on the effects of CSR. This is followed by a discussion of reform implementation in the education system and changes in the way education is financed (Chapter 2).

Chapter 3 uses a simulation of CSR implementation in Florida to provide information on the cost of CSR and how policy decisions affect that cost. This chapter will help policymakers understand how much CSR will cost in relation to three important policy decisions:

- What is the class size goal,
- How class size is measured, and
- How many students are affected by the policy?

The cost of CSR is estimated in Florida, but the relationships between policy, enrollment, existing class size, and cost are applicable to any state. The costs of various policy choices concerning facilities used for and staffing of reduced classrooms are evaluated. Regression analysis is used to produce four simple "rules of thumb" that describe how policy decisions affects costs in schools with different existing class sizes and enrollments.

Chapter 4 examines which strategies work best to reimburse the cost of CSR to either districts or schools using information from the Florida school districts. The chapter provides information to help policymakers decide how to calculate reimbursements to districts or schools for CSR, given the availability and quality of information to make the estimates. The key questions addressed are:

- What price should be used for classrooms, the sample-wide average prices or district average prices, and

- At what level should the additional number of classrooms required for CSR be calculated, the state (sample in this example), district, or school level?

The effectiveness of four strategies is compared in their ability to estimate the total cost of CSR and costs at the district and school level. Information on funding schools directly is provided in anticipation of state funding flowing directly to schools as advocated in several different reform efforts (Fowler, 1998).

Finally, Chapter 5 describes the changes in teacher qualifications that occurred during CSR implementation in California. The analysis in this chapter addresses three questions:

- Did CSR cause a decline in teacher qualifications,
- Was the decline equal across all schools or concentrated in schools with more minority or poor students, and
- What was the movement of teachers that caused the changes in teacher qualifications?

Knowledge of this flow facilitates the crafting of CSR policies to reduce the inequalities seen in California.

The results of the three analysis chapters are discussed in Chapter 6. Armed with the information produced in these three different analyses, policymakers are equipped to avoid the problems seen in California, or at least reduce their severity.

# CHAPTER 1: POLICY CHOICES AND CLASS SIZE REDUCTION

## INTRODUCTION AND SUMMARY

CSR receives wide support among practitioners and parents. This support exists despite its large cost and mixed findings of effectiveness in the research. Considerable research shows limited or no change in student performance after class size was reduced or in smaller classes. The Tennessee STAR experiment, on the other hand, showed immediate and long-lasting improvements in student performance after CSR. The one area of relative agreement among CSR researchers is that there is a lack of a theoretical understanding of how class size affects student performance. In this context of uncertainty about CSR implementation, policy decisions matter. Policy decisions can affect the costs of CSR, both pecuniary and non-pecuniary, and the ability of schools and districts to implement it. This chapter reviews what CSR is, the existing research on CSR, some of the recent California experiences in implementing CSR in kindergarten through third grades (K–3), and how policy choices matter.

## CLASS SIZE REDUCTION: WHAT IS IT?

*"There is more time to teach. The class is more cohesive and dynamic. There is room for students to spread out and complete assignments without being distracted by noise or proximity. I can work one-on-one to ensure student comprehension and success. There is harmony and learning taking place in my classroom."*

Veteran teacher in El Rio, CA, after CSR implementation in her classroom (Bartell & Weiss, 1997)

Generally CSR policy is formulated at the state or federal level to be implemented at the local level by school districts. The general form is a state or federal policy that sets a class size goal for a set of grades and/or subjects. The policy constitutes class size reduction if the existing class sizes are larger than the policy goal. Within a state there can be a large range of class sizes, with some students already sitting in small (or reduced) classes.

The ECS describes a multitude of state CSR policies, with most states providing some sort of additional funds to districts for implementation. CSR policies can vary on at least three important dimensions. The first dimension is the grades or subjects that are targeted for reduction. For example, California's recent CSR initiative targeted first grade, then second, followed by kindergarten and third grades. But this recent focus in California on early grades came several years after a program providing incentives for reducing class

sizes in grade nine. Programs in Nevada, Iowa, and Illinois all target specific subjects including reading or "core subjects" rather than specific grades (ECS, 1999).

A second way that CSR policies vary is the mechanism that is used to get schools and districts to reduce class sizes. Many states (e.g., California, Iowa and Illinois) and the federal government provide grants to school districts (or states in the federal case) to implement CSR. These grants can vary in restrictions on the use of funds. For example, Iowa uses block grants that can be used to reduce class size, but can also be used on other measures that improve reading proficiency. In California, funds are paid on a per-student basis and a district loses funds for all students who are in classrooms with more than 20 students. Simply mandating smaller classes is an alternative mechanism used in several states including Utah, Texas and South Carolina.

A third dimension on which CSR policies vary is simply the target size of the classroom and its measurement. State CSR target class size ratios include 23, 21, 20, 18, 17 and 15 to one.

An important policy and research issue is how class size is measured. The method of measurement is an important indicator of flexibility at the district level. California has a very restrictive measurement scheme that requires that class sizes remain below a ceiling level throughout the entire school year. The California Legislative Analyst's Office (LAO) found the state's restrictive measurement scheme may have raised costs up to 21% because class sizes were reduced to 19:1 to ensure that class sizes did not break the 20:1 cap (Hill, 1997). Brewer et al. (1999) found moving class size measurement from school level to district level could change the yearly cost of a national CSR policy by about 15% or $900 million. These examples show how seemingly simple measurement decisions can have large effects on the final cost of CSR, reinforcing the need for CSR policy choices to be informed by their cost ramifications.

## Measuring Class Size: A Continuing Challenge

*"Class size is an administrative measure typically defined as the number of students for whom a teacher is primarily responsible during a school year"*

Lewit & Baker 1997

The issues around measurement of class size extend beyond policy formation into research. Class size is a seemingly simple concept that is actually fairly difficult to consistently measure. The idealized picture of one teacher in a classroom instructing the same group of children for a day does not match the reality in many schools. For researchers and policymakers it is the students' "experienced size that is of primary interest" (Goldstein & Blatchford, 1998). The "experienced class size" is directly related to the quantity of instruction that a student receives and the resources brought to bear on a student's education. Difficulties in measuring this experienced size stem from three issues: the dynamic nature of classrooms, the variety of classroom models, and the lack of

precise measurements of what occurs in schools and classrooms. These factors add noise to a measure of experienced class size.

Classrooms are dynamic places, with students and adults moving in and out of the rooms and constant regrouping of students into smaller or larger groups that can be seen as "classrooms within classrooms." The end result is that the class size students' experience varies almost constantly. Goldstein and Blatchford suggest a continuous measure of class size as the ideal basis for research. Variation of class sizes experienced by students, compared to class sizes reported and measured, may account for some of the problems relating student performance to class size. An example of an attempt at a continuous measure can be seen in Bourke's (1986) observational study of class size and teacher behavior. Here class size was measured every five minutes.

Another problem with measuring "experienced" class size is that classroom resource use strategies vary across and within districts and schools. This results in changes in a student's primary instructor throughout the school day. School districts and schools vary in their use of instructional resources such as aides, pullout classrooms, resource teachers, and specialist teachers. The resource use strategies are a product of many factors including district-level policy choices, collective bargaining agreements, or school-level decisions based on school-level conditions (Lewit & Baker, 1997). Hallinan and Sorensen (1985) argue that student grouping mediates the affect of class size on student achievement with ability group size as a stronger indicator of changes in achievement than class size. For example, consider the whole school reform "Success for All" that employs all instructional personnel in a school, including specialist teachers such as librarians or art teachers, as reading instructors (Slavin et al., 1996). In the end, students experience reading class sizes that are up to a third smaller than their classes during the rest of the day. In this reform, measurements of class size based on the number of regular classroom teachers in a school will not capture the class size students experience throughout the day.

A third source of noise in class size measurement is simply the metric used to measure class size. Measurements used in research include pupil-teacher ratios, pupil-professional ratios, and class size based on the number of students assigned to a given teacher. Average class size is the most widespread of all the measures (Lewit & Baker, 1997). While there is some relationship between these measures, they are not perfectly correlated and may mask real differences in the class size student's experience.

There is disagreement not only on what to measure when discussing class size, but also on the key question of what level to take the measurement at. Should class size be measured at the district level, at the school level, at the grade level within a school, or at the classroom level? The higher the level of measurement, the easier the measurement is to record, but it also masks wide variation in students' experienced class size. Measurement at the district level is regularly reported and may be the most accessible since most districts have counts of students and teachers for every grade. Measurements at the school level are a commonly used metric in reporting school-level indicators, but

often averages across the grades in a school, masking differences across grades. For example, imagine an elementary school with equal numbers of sixth and first graders but with different staffing patterns for each grade, such as larger classes for sixth graders (30:1) and smaller classes for first graders (20:1). A school-level average will be between these two patterns (25:1) and would not accurately represent the experiences of either group of students. Grade-level class sizes within a school would counter these problems but are rarely provided. This may be due to the methodological difficulty of dealing with classrooms with students from different grades.

Class size is a simple concept that is difficult to measure. The dynamic nature of classrooms, variation in school-level resource strategies, and continuing questions about the metric to use reduce the ability of researchers and practitioners to describe (and evaluate) the class sizes that students experience. The cost analysis in this dissertation will use measurements of class size at the school and grade level. This measure is based on the reported class size by grade, capturing differences across grades, but still masking differences within a grade. While the differences in within grade practices are important to an individual student's experience, they do not effect the cost of CSR.

## INTRODUCTION TO CLASS SIZE RESEARCH

At least in part because of the concept's simplicity and the availability of district- and school-level measurements, the literature on class size is extensive. There are many literature reviews and summaries of the effects of class size starting with Glass and Smith (1979) through Grissmer (1999). Despite the volume of research devoted to class size, there is little consensus on the effects of class size on student achievement. Most non-experimental data show mixed positive and negative effects associated with small classes (Hanushek, 1999). The largest CSR experiment, the Tennessee Student/Teacher Achievement Ratio (STAR) experiment, shows clear positive and long-lasting affects on student outcomes (Word, 1990, Nye, Hedges & Konstantopoulus, 1999). There is also a dearth on information on the mechanisms through which CSR affects achievement (Finn et al., 1989). Many authors have also raised concerns about the costs of CSR and the need for more cost information (Odden, 1990). The largest effort to reduce classes is occurring in California. Early evaluation of this program confirms many of the concerns and hopes of CSR's supporters and detractors: It is expensive, but it does make limited improvements in student achievement despite very small measured differences in teacher behavior (Bohrnstedt & Stecher, 1999).

### Mixed Evidence From Non-Experimental Studies

*"System-wide class-size reduction would have little effect on student performance and even if it did, would cost too much money."*

Odden, 1990

As part of an overall critique on educational resource policies, several reviewers of class size studies found no clear evidence that smaller classes (or increased educational spending for that matter) are associated with improved student performance (Hanushek, 1999, 1998, 1996, 1989, 1986, Hanushek & Rivkin, 1997, Odden, 1990). Starting in the late 1980s, Hanushek and others have argued that there is little evidence supporting increased school expenditures and associated decreases in the pupil-teacher ratio (instructional staff are the largest single operational education expense[2]) to improve student achievement. The general argument begins with the observation that over the last 40 years real expenditures on education have steadily increased, with pupil-teacher ratios declining from 25.6 in 1960 to 17.3 in 1990. At the same time, student achievement data over the past 25 years show no improvements. For example, high school reading, math, and science National Assessment of Education Progress (NAEP) scores have remained essentially flat since the early 1970s.

There are two general criticisms of the use of overall increases in real expenditure as a measure of the intensity of classroom resource use. First there is disagreement over the appropriate correction factor for inflation. As pointed out by William Baumol, industries where it is hard to improve productivity will suffer from higher than average inflation (Baumol, 1993). Thus estimates of increases of real expenditures that use the consumer price index (CPI) may overstate increases in education expenditures. Rothstein and Miles (1995) recommend using a "net services index" instead of the CPI-U. Using this inflation adjuster, they estimate real education spending increased 61% between 1967 and 1991 compared to 99% using the CPI-U. Hanushek and Rivkin (1997) agree that the "Baumol effect" is present in education. They find that after adjusting expenditures for inflation, increases between 1890 and 1990 in the cost of teachers account for about 43% of the overall increase in instructional expenditures. However, they also ague that over the most recent period (1970–1990) the most significant factor in increased expenditures was increased intensity in the use of teachers, with the pupil-staff ratio declining from 20.5 to 15.4.

Another criticism is simply a questioning of the relationship between expenditures and classroom resource use. Rothstein and Miles (1995) in a detailed analysis of expenditures in nine districts suggest that while overall education expenditures have increased, the share of expenditures used in regular education has declined by 21 percentage points. This does not mean that expenditures in regular education have declined, instead regular education did not grow as fast as special education. The proportion of new spending that went to regular education was 28%, while the proportion of new spending that went to special education was 38%. Hanushek and Rivkin (1997) argue that despite the increases in special education expenditures the overall program is too small to account for the overall increases in resource usage. They argue that growth in staffing for special education

[2] Expenditures on instructional salaries and benefits constituted 57% of public elementary and secondary expenditures in 1996–97 (NCES 1999), Table 162.

accounts for about 40% of the overall decline in the pupil-teacher ratio between 1980 and 1990.

It is difficult to disentangle all of the sources of education expenditure increases. A significant amount of this increase, but much less than half, is due to the relative increase in the price of teachers due to the "Baumol effect." Another significant driver of the overall increase is increases in the resources devoted to special education. It appears that regular education expenditures have increased, but the magnitude of this increase is not clear. As will be discussed later, the increases in teacher salary expenditures were not enough to maintain teachers' salary levels relative to other occupations that require college degrees.

The increases in regular education expenditures appear to have led to smaller class sizes, without resulting in improved student test performance. These findings are bolstered by a review of over 277 econometric studies that consider pupil-teacher ratios as a factor in student achievement. Well over half are statistically insignificant, with roughly half of those that are significant showing a negative association between class size and student achievement. These are the findings one would expect if class size did not play a positive role in student achievement (Hanushek & Rivkin, 1997).

A key problem with econometric studies is the endogeneity of class size with achievement. That is, did class size cause changes in achievement, or are small classes simply more often found in schools or classrooms that have high-achieving students? For example, achievement is clearly associated with parental earnings; do parents with high earnings and high-achieving students also demand small classes? Another possibility is high-achieving students may be tracked into smaller classrooms

Several researchers (Hoxby, 1998, Angrist & Levy, 1997, Akerhielm, 1995) have attempted to avoid this bias by using instrumental variables for class size. An instrumental variable is effective when it is correlated with the independent variable in question (class size), but is not related to the dependent variable (student achievement). These three studies yielded mixed results. Hoxby found no effect when comparing classes of 15 and 30. Angrist and Levy, as well as Akerhielm, found slightly better student performance and potentially cumulative improvements with smaller class size.

Researchers propose different reasons as to why they did not find associations between smaller class sizes and improved test scores. Hanushek (1999) argues that one issue is teacher quality. Hoxby argues that the findings of improved student achievement in the STAR study are a result of the expectation that smaller classes would result in improved performance. As an example of a "Hawthorne" effect, Hoxby argues that teachers in the STAR small classes knew they were being evaluated and this motivated them to improve student performance.

Odden (1990) argued that given CSR's high costs and the average effect size of .1[3], other less expensive and more promising reforms should be pursued. He supported targeted class size reduction to allow small group tutoring for struggling students and to target specific subjects such as reading and language arts.

## Experimental Results: More Enthusiasm

The more enthusiastic supporters of CSR often use the findings from Project STAR in Tennessee (Nye, Hedges, Konstantopoulos, 1999, Finn & Achilles, 1990 & 1999, Pate-Bain et al., 1997, Mosteller 1995, Word et al., 1990, Finn et al., 1989). Project STAR was a state-run four-year experiment during which kindergarten through third grade students and teachers in 79 elementary schools were randomly assigned to classes that were either reduced (13–17 students per teacher), regular size (22–25 students per teacher), or regular size with a full time aide. New students and teachers were also randomly assigned to classes.

In summary, Project STAR found students in smaller classes consistently performed better than students in larger classes by an effect size ranging from .15 in kindergarten to .25 in grades 1 through 3. Minority students (mostly blacks) showed greater gains in performance than whites. No difference was found between regular classes with an aide and those without (Word et al., 1990).

The Lasting Benefits Study tracked STAR students beyond third grade and found continued positive differentials between students who had been in small classes and those who had not. Fourth grade students who had been in smaller classes were generally found to have more initiative, make more effort, and show less non-participatory behavior (Finn et al., 1989). Differences in median student test scores between students who had been in reduced classes compared to those who attended regular sized classes ranged from .18 in fifth grade through .14 in seventh grade (Finn 1998). Later analyses of student test scores in grades 4, 6 and 8 found sustained higher test scores for students that were in small classes in kindergarten through third grade in all subjects. By grade 8, the difference in test scores was at least 70% of the size of differences seen in third grade (Nye et al 1999). Differences in course enrollment and indicators of disciplinary problems were also seen in a smaller sample of STAR participants in high school. Looking at three school districts, students who had been in smaller classes took more foreign language courses, and looking at two rural school districts, students who had been in small classes took more advanced academic classes. Students who had been in small classes within a larger urban district on average spent fewer days in suspension and absent in grades 8 through 10 (Pate-Bain et al., 1997).

[3] An effect size is the change in outcomes (in this case student achievement scores) in terms of standard deviations of the base or control group scores. So an effect size of .1 indicates that achievement scores of the treatment group were .1 standard deviations above the scores for the control group.

These seemingly consistent positive outcomes from reduced classes do raise some areas of concern. The majority of the improvements to students in smaller classes occurred in kindergarten. It is reasonable to expect that each "dose" of sitting in a small classroom might lead to increases in the differential in student performance. But this does not appear to be case. Instead, most of the gains appeared in kindergarten and simply continued through the third grade. These findings do not lend support to wholesale reduction across all grades. Instead they are more supportive of reductions focused in kindergarten and first grade (Word et al., 1990).

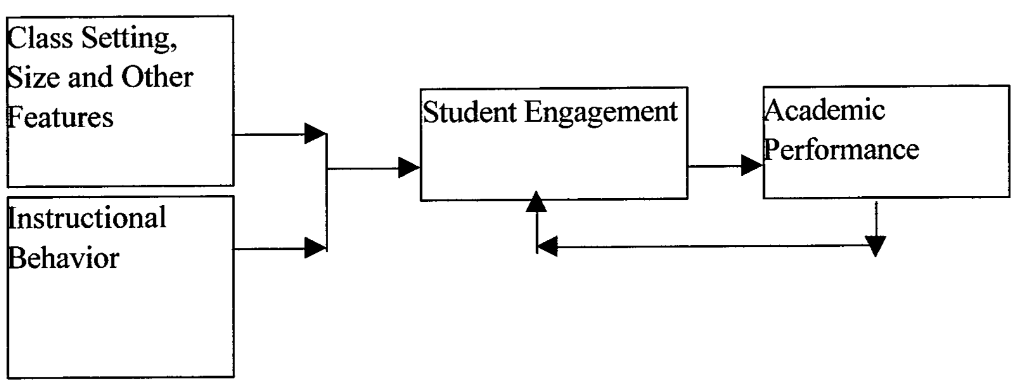
Finn and Achilles (1999) recently argued that the test publisher's scaling procedures caused the stability in the effect sizes. They used grade equivalents (GE) as an alternative scaling procedure and found students who were in small classes showed continuous improvements over students in larger classes in most subjects from kindergarten through seventh grade. Using this alternative scale, the authors argue that the positive advantages to sitting in small classes in grades K–3 were cumulative through at least seventh grade.

## A Problem for All: A Lack of Theory

*"There is a sense in which class size is a psychologically empty concept."*
Finn et. al. (1989)

A key problem with class size research is a lack of understanding of exactly what occurs in smaller classes that leads to student improvements. A consistent theory on how smaller class size affects student performance would facilitate both non-experimental and experimental studies. Finn (1998) offered a portion of the "participation-identification model" in a discussion of the benefits of smaller class sizes for students at risk.

**FIGURE 1.1 FINN'S PARTICIPATION-IDENTIFICATION MODEL RELATING CLASS SIZE AND ACADEMIC PERFORMANCE**




Source: Finn ,1998

This framework indicates that both class setting and teacher behavior affect student engagement, with changes in student engagement affecting student achievement, and achievement reinforcing student engagement. In this framework, reducing class sizes is not sufficient to maximize student performance. Optimal performance also requires changes in teacher behavior.

Unfortunately, just as improvements in student achievement are not consistently found in smaller classes, changes in teacher behavior are also not consistently found. Blanchard and Mortimore (1994) reviewed the findings to date on classroom effects and consolidated these findings into eight categories. To organize Blatchford and Mortimore's categories, they are placed within Finn's framework. Blatchford and Mortimore did not consistently find changes within any of their categories. Instead they concluded "research has shown that class-size reductions have little effect on teacher's behavior..." (Blatchford & Mortimore, 1994).

Instructor behavior
- Increased individual attention for students by teachers
- Increased "quality" teaching
- Changed curriculum coverage

Student Engagement
- Increased pupil attention
- Decreased teacher time on behavior management

Class Setting
- Better student and teacher morale
- Better pupil to pupil relations

Other
- More time for teachers

The STAR results show student gains are concentrated in the first year(s) in school, with differences in performance lasting into high school. A theoretical description of these effects should describe how smaller classes affect student performance in the smaller class and also explain what changes in students allow the effects to persist into later grades. This suggests there is some sort of student socialization is facilitated by smaller classes in early grades that is not directly addressed in Finn's framework.

An example of the challenge in finding differences in classroom behavior between small and large classrooms is the well-designed study of classroom processes in Toronto reported by Sharpson et al. (1980). Using numerous instruments and measures of teacher/student behavior and attitudes, Sharpson found "the observation of classroom process variables revealed very few effects of class size" with "virtually no changes in methods of instruction used by teachers in the different class sizes." Sharpson argued, as many do, that teacher training is key to taking advantage of the opportunities that small classrooms present. In fact among the reviewers and researchers on class size, this seems to be one area that most agree on.

However, the lack of a theoretical base linking CSR with improvements in student behavior limits the ability of practitioners to develop guidelines on the skills that should be stressed in CSR teacher training. In Project STAR, a small cohort of second grade teachers from both reduced and non-reduced classrooms received the same training with no effect on student test scores (Word et al., 1990). Some of the school districts in Ventura County, California, conducted workshops for teachers in association with the statewide CSR efforts. A non-random survey of teachers by the Ventura County Superintendents Office (Bartell & Weis, 1997) found that variations in how training affected teachers were correlated with teacher experience. Veteran teachers (those with more than one year of experience) were more likely to change teaching practices to incorporate individualized instruction, flexible grouping, and more frequent use of assessment. First-year teachers were more likely to change classroom and time management practices as a result of training. This relatively weak evidence from Ventura County illustrates the paucity of evidence on the relationship between class size, teacher training and student performance. Clearly more effort is needed in understanding the skills teacher should learn in CSR focused training.

The lack of agreement on the efficacy of CSR and lack of understanding of teacher training needed to implement CSR point out the need for increased understanding and theorizing on the interaction of policy, teaching, and learning.

Grissmer (1999) argues that the lack of a theoretical link between class setting, teachers, parents, and student behavior hampers the ability of non-experimental studies in finding results. This leads to the mixed results seen in non-experimental results. Grissmer's call for more sophisticated models can also be seen as simply a request for better data in doing non-experimental education studies. These more sophisticated models will require a richer understanding of students' educational environment. They require data beyond the inputs that students and schools bring to education, to include a better understanding of the education process (Grissmer suggests focus on time-on-task), teacher quality, as well as parental involvement and behavior. These data requirements can only be met through intensive and expensive efforts, greater than what is currently devoted to most educational studies. It may be that experimental studies could become relatively less costly because they use randomization to account for difficult-to-measure constructs.

## CSR IN CALIFORNIA: CONFIRMING EVERYONE'S VIEW

In the summer of 1996 California lawmakers found themselves in a curious position. After years of budget cutting during the recession of the early 1990s, they suddenly faced a budget surplus. The state constitution required that a majority of the surplus be allocated to education. The combination of constitutional spending requirements, recently released STAR findings, and a continued interest in CSR by teachers' unions, came together in California's massive early elementary CSR program. During the first year, $900 million was distributed to school districts at a rate of $650 per child in a classroom

with 20 or fewer other students for a full day or $325 per child in a class of 20 for a half day. The priority for reduction was first grade, then second, then either third or kindergarten. Two hundred million dollars of the original $900 million was distributed in the form of one-time $25,000 grants for new classrooms. During the second year of CSR implementation, school districts were given $800/$400 (full day/half day) per child in a reduced classroom with new classrooms grants going up to $40,000. By the end of the second year of implementation, almost all first and second grade students were sitting in reduced classes and about two-thirds of kindergartners and third graders were sitting in reduced classrooms. (Bohrnstedt & Stecher, 1999). Within three years, about 99% of K–3 students were sitting in reduced classrooms (Stecher & Bohrnstedt, 2000).

The implementation of CSR in California showed that CSR is relatively easy to quickly implement, but very expensive. Within three years, 29,000 additional teachers had been brought in, resulting in a total of 91,000 K–3 classrooms providing 1.7 million students with (small) measurable benefits. This can be compared to an evaluation of the Elementary and Secondary Education Act (ESEA) by Berman & McLaughlin (1978) who argue that it takes in the order of seven years of implementation for the educational effects of a new policy to become apparent. But again, CSR is very expensive. California's CSR initiative is the most expensive state education reform in the United States at about $1.5 billion a year. This does not include additional resources devoted to CSR at the district and school level (Borhnstedt & Stecher, 1999).

California's CSR experiences fit well into the mixed CSR literature about costs, student achievement, and teacher behavior. The achievement gains attributable to CSR are very small, with an effect size of about .1. This is at the bottom end of the STAR findings. These results fit into the range found in experimental results, but were small enough to fit the expectations of skeptics. Few changes were found in teacher classroom behavior. Teachers did not measurably modify what they taught or how they taught. Instead teachers in reduced classrooms spent a little less time disciplining students and instructing the whole class. They also spent a little more time with problem readers.

An important outcome of California CSR policies are problems associated with equitable resource allocation during implementation. A key cost and equity issue raised with the implementation of CSR in California was the availability and distribution of qualified teachers in the new classrooms. These issues are addressed extensively in Chapter 5.

One of the causes of equity problems as CSR in California was implemented was that CSR reimbursements were not tied to actual costs. CSR was a financial boon for some districts and a financial strain on others. As discussed earlier, districts received a flat dollar amount per student in a reduced classroom, regardless of the amount of effort it required to create the reduced classroom. So for districts that already had small classes, CSR was relatively cheap and in some cases free. In other cases, when class sizes were large, when rooms for extra classes were scarce, and when schools or districts were small, CSR was very expensive. Some districts were reimbursed $650 (in 1996–1997) per student when the actual cost was zero. At the same time, some districts were reimbursed

the same amount when the costs were closer to $1,000 per student (Hill, 1997). A survey of superintendents found 56% reported costs above the state reimbursement of $650 per student. At the subsequent rate of $800 per student, 43% still believed that costs of the program were beyond the reimbursement amounts (Bohrnstedt & Stecher, 1999).

A better understanding of the implementation costs of CSR could have been used to alleviate these disparities, resulting in increased efficiency in the expenditure of state resources. Reimbursing the actual cost of class size reduction would have avoided two problems. First, there was an unintended consequence of CSR dollars supporting other programs in districts where CSR costs were less than the reimbursement. Second, funding for other programs were reduced in districts where implementation costs exceeded reimbursement rates.

The lack of a link between reimbursed cost and actual cost raised equity issues in terms of the rate of implementation. The implementation rate was directly tied to difficulties some districts had due to conditions at the schools, such as lack of additional space, large classes that required extra efforts to reduce, and rapid enrollment growth. Of those principals who were unable to implement CSR, 81.0% cited the lack of space for new classrooms as the cause (Borhnstedt & Stecher 1999), despite the facilities grants that were available. A separate analysis of data on the rate of CSR implementation found that districts with the largest class sizes before CSR (greater than 30) were more likely to have slower implementation. The same study found lower implementation rates in districts with higher growth rates (Travers, 1998).

An understanding of the number of classrooms needed given the school size and existing class size in schools would assist in reducing CSR implementation constraints due to lack of space. This information would give policymakers and administrators an understanding of the range of additional space needed. Optimally the information on the range of space needed could be combined with information about the available classroom in schools to determine how to best distribute funds for new classrooms. Unfortunately, information on existing space usage is not regularly gathered so there is no good database of information. This information could be gathered as part of CSR implementation, but would need to be verifiable.

## Existing Information on CSR Costs

There is limited available information on the costs associated with class size reduction. None of the available estimates completely capture the interactions between costs, school-level conditions (existing class size, school size), and policy choices (class size goal, grade level, and flexibility in implementation). Four estimates are available in the literature on a "cost per student" basis: Levin, Glass and Meister (1987), California Legislative Analysts Office (LAO) (Hill, 1997), Travers (1998), and Brewer et al. (1999).

Each estimates the marginal cost of CSR, or the expenditure per student for the additional classrooms needed to reduce class size to a given policy goal.

Levin's cost estimates were made using 1980 prices that have been inflated to 1997 levels using the CPU-I[4]. Travers' are in 1997 dollars, and the California LAO's are in 1996 dollars. Brewer's estimates were made using 1998 dollars.

Levin and Travers do not take into account variation in school enrollment, though Levin's estimates do consider existing class size. Levin estimated the cost of reducing from 35 to 30 to be $263, from 30 to 25 to be $367, and from 25 to 20 to be $548. Using a small sample of districts, Travers estimated the cost of California's reduction to 20 from an average class size of about 29. His estimates range from about $750 to $850 per student. Both Levin and Travers produce similar cost estimates for reduction (around $800), but for different bundles of classroom resources. Levin's estimates include facilities costs while Travers' do not. Travers also predicts the long-term cost of CSR to be between $850 and $1000. The cost increase is due to the teacher salary scale rising automatically with experience.

Brewer et al. (1999) estimated the cost of a national CSR policy. They estimated the average cost of reduction from current class sizes to 20 to be $189, $448 for reduction to 18, and $981 for reduction to 15. This work highlights the changes in costs due to variation in policy choices about class size measurement. Brewer found that measuring class size at the district level instead of the school level decreases costs by about 16%. These estimates are the lowest of the three because calculating class size at the district level provides implementation flexibility that reduces costs, and because of the assumption that new facilities are not needed. The long-term estimates of $562 per year for a class size of 18 again include increases in expenditures over nine years due to increases in teacher salaries.

The California LAO's estimates used district-level teacher costs, average class size, and enrollment in making their estimates. The California LAO estimated the average cost of reduction to 20 for large districts (over 20,000 students) to be $690 per student, $810 for districts with 5,000 to 20,000 students, $800 for districts with 1,000 to 5,000 students and $710 for districts with less than 1,000 students. These estimates, like Brewer's, point out the interaction between district size and costs. Mixed in with the district size issue are the relationships between district-level teacher costs and the cost of CSR.

All of the estimates were made using different sets of assumptions about the cost of facilities and the level within the education system at which class size is measured. Levin's estimates assume new facilities are needed for CSR, while the California LAO, Travers, and Brewer do not. Levin and Travers assume that school districts have relatively little implementation flexibility, in that class size is measured at the school

[4] Cost of all items in 1980 82.4, and 160.5 in 1997, 1998 Statistical Abstract of US.

level, while Brewer assumes school districts have more flexibility in implementing CSR in that class size is measured at the district level.

## CONCLUSIONS FROM RESEARCH

The research is divided on the benefits of CSR. The experience in California and the Tennessee STAR experiment show that CSR is an educational reform that can be implemented rapidly, in a widespread fashion, and result in (small) improvements in student performance. This is in contrast with non-experimental literature or the literature drawn from smaller experiments that show mixed improvements in student achievement. Despite lack of agreement on achievement outcomes from CSR, there is agreement in the literature regarding the lack of a theoretical base that can explain why and how smaller classes are (or are not) important to student learning. At the same time, while it is well understood that CSR is expensive, the factors that affect cost at the school level and the relative magnitude of these effects are not documented. The implementation of CSR in California raised important equity concerns related to teacher quality and simply the ability, or even just the space, to implement the program. So while CSR is expensive to implement for all schools, it may be even more expensive for some schools based on their lack of space or disadvantages they face in competing for good teachers.

## WHY POLICY CHOICES MATTER

As stated earlier, CSR is generally a policy made at the state or federal level to be implemented at the local level. The parameters of the policy formulated at the higher levels of the system (i.e., state or federal level) have very important implications as to which students are effected by CSR, how they are affected, when they are affected, the amount of the final cost for the policy, and who pays.

Policymakers must decide which grade(s) to target with a CSR policy. The current research suggests the largest effects are found in the earliest grades, K and 1 (Word et al., 1990). In deciding the grade(s) to target for CSR, policymakers begin to establish one of the key cost dimensions--how many students sit in reduced classes. Reduction in more grades increases the number of students siting in reduced classes and raises the total cost.

The second policy dimension is the class size goal, i.e., how large will reduced classroom be. The amount of the reduction is a key element in the cost of CSR.

The third issue is how class size is to be measured. Strictly enforced class size ceilings at the classroom level increase costs relative to schoolwide or district-wide averages that can allow flexibility in implementation to meet local conditions. Measuring (and enforcing) a smaller class size throughout a year is more difficult (and costly) than establishing smaller class sizes for a particular point in time in schools that have high levels of student mobility. Finally policymakers have to define the pace at which they want CSR to be

implemented. Rapid implementation may drain the market of resources needed for uniform implementation across all schools.

There are non-pecuniary costs associated with implementing a policy that are not directly measured in dollars, but are movements away from expected levels of facility quality and teacher qualifications. In California, CSR implementation has clearly been associated with declines in the quality of classroom space as classes are held in facilities not intended for instruction including storage space, gymnasiums, and libraries. Many new classrooms in California were portable or temporary classrooms. It is not clear that these represent a decrease in quality. Temporary classrooms can have newer technology, better access to bathrooms and reduced distractions because they are removed from the main buildings (personal interviews in Florida). Others view temporary classrooms as being poorly built, loud, and isolating.

Changes in teacher qualifications were clearly seen during the implementation of CSR in California. The rapid addition of over 29,000 teachers in three years led to declines in the overall experience, education, and credentialing level of the K–3 workforce. More importantly, these declines were concentrated in schools that served larger proportions of poor, minority and English language learners (ELL). The end results of the rapid CSR implementation in California were declines in the quality of classroom space and teacher qualifications. It also resulted in reduced equity in the distribution of good classroom space and qualified teachers. The teacher qualification issues will be fully addressed in Chapter 5.

There are options available to policymakers to decrease both the expenditures and the non-pecuniary costs associated with CSR. There are an array of policy decisions about who is affected, the target level for the policy, and how that target is measured. Those policy decisions affect the both the long- and short-term out-of-pockets costs as well as the non-pecuniary quality and equity costs of the policy implementation. Clarifying and enumerating some of the relationships between CSR costs and policy decisions will be the tasks of Chapters 3, 4 and 5 of this dissertation. This information should aid policymakers as they make the trade-offs inherent in the various policy options.

# CHAPTER 2: CONTEXT OF CSR IMPLEMENTATION

## INTRODUCTION AND SUMMARY

As discussed in the previous chapter, CSR generally takes the form of a policy made at the state or federal level that is then implemented at the local level (ECS, 1999). Lessons learned from evaluation of education and other reforms shows that policies designed at the higher levels of the system are difficult to implement with fidelity to policy designs.

Despite the difficulty in implementing policies that flow from upper levels of the education system, all levels are under pressure to reform. Policymakers at the state level are taking on, or being assigned, the responsibility for education. For example, Kirp and Driver (1995) report that the California education code has tripled in size. At the same time, the proportion of the state budget that was specially earmarked for education has increased from 12.3% in 1969 to 26.9% in 1992.

Key changes in the school finance system set the context of reform policies, including CSR. First there has been a centralization of sources of school revenue to the state and federal level. At a minimum this centralization lessens local control over the amount of revenues available, but equally important centralization can be seen as an avenue of increased state and federal control over local operations. At the same time many reform movements (school-based management, charter schools and vouchers) involve moving authority over fund allocations and other policy decisions to the school level. These reform movements may decrease the ability of state and federal policymakers to affect what occurs in schools. These two seemingly divergent trends in authority and responsibility cloud the notion of who is responsible for educational outcomes. This section attempts to describe how CSR fits into this changing education system. CSR may represent one of the few education policy levers that state policymakers can use that can be implemented quickly, with fidelity to their designs, and can be expected to produce positive achievement affects. A better understanding of the limitations state (and federal-level) policymakers face in the education arena may encourage movement toward clearly defined roles for each level of the system.

## THE EDUCATION SYSTEM

The education system in the United States can be thought of as having four separate levels: federal, state, district (local), and school level. A textbook view of the system focuses on the top three levels that provide funding for the system: federal, state and school districts (Monk, 1990). However, because policy implementation occurs at the school level and is dependent on school-level characteristics (Kirp & Driver, 1995), and because there are several reform movements that seek to increase school autonomy

(Bodilly, 1998, Odden & Picus, 1992, Chubb & Moe, 1990), it seems reasonable to discuss schools as separate actors in the education system [5].

At each level there are multiple, diverse organizations. In 1996 there were some 14,772 regular school districts including one statewide district in Hawaii. There is wide diversity in the size of the districts with the largest 226 districts enrolling just over 31% of all students and the smallest 21% of districts (3,160) enrolling only 1% of the students. There were just under 86,000 schools in 1996, which are at least as diverse as school districts, ranging in size from under 100 students to over 3000 (U.S. Department of Education, 1999). This wide diversity of schools and school districts is part of the reason formulation of policies for all schools difficult. Even within states there is wide diversity of schools to which policies must apply.

The federal role in education is limited. The main focus of federal regulation and funding is equitable treatment of various populations. The state share of education revenues has generally risen since 1900. State regulation of education is more general than the federal government's. School districts derive their legal status and authority to operate from states. School districts are responsible for allocating resources to schools. Schools operate under districts but they have some autonomy and many recent reforms work to increase school independence from districts.

It is through this large and diverse system that the United States works to meet its educational goals. There is a multiplicity of goals for the entire education system, and there are multiple definitions of education. Nevertheless, it is reasonably safe to assume that despite variations in definitions[6], there are general systematic goals of providing this education in an equitable and efficient manner. The exact definitions of an equitable provision of education will be debated for many years to come. For the purposes of this work, equity will be discussed in terms of equal burdens from resource collection and equal benefits from resource distribution. Efficient provision of education relates to use of resources in a cost-effective way.[7]

As policymakers at different levels of the system attempt to formulate policies for implementation at the lower levels of the system, they must be cognizant of the degree of linkage or coupling between the levels. The education system has been described as

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[5] This structural approach to the education system can be compared with the functional approach taken by Elmore & McLaughlin (1988). This approach uses three levels: Policy, Administrative, and Practice. They suggest policy is made at the federal, state and district level, administration is done at the district and school level, practice occurs only at the school level.

[6] For National Goals see the National Education Goals Panel at http://www.negp.gov/page3.htm. As an example of effort to enumerate a school districts goals, see R. Rothstein's recommended Accountability Index for the Los Angeles Unified School District located at http://www.epn.org/rothstei/Lausd/LAUSDindex1.html.

[7] This definition is the same as technical and allocative efficiency of production economics where given a combination of inputs, the maximum output of produced and all inputs are used. It is not the same as efficiency of exchange, which involves the distribution of goods and services. See Monk, 1990.

loosely coupled in that "decision(s) at one level in the system may not have an impact at other levels of the system" (Berman & McLaughlin, 1978, pp. 6). An indicator of a loosely coupled system is that actors within the system are coupled neither by the technical core of organizations or the authority of office. Technical core coupling refers to the level at which organizations are dependent on each other for participation to complete the tasks central to the organization. Clearly schools can complete their central tasks of educating students without participation from members of other organizations within the system. Except for school-level officials, all members of the system derive their political authority of office independently of other members of the system.[8] Thus the education system is not tightly coupled in either of these key areas. In the current education system, organizations within each level of the system retain their own identity regardless of the actions of organizations on the other levels of the system, and different configurations of organizations within the system result in the same ends (Weick, 1976, Berman & McLaughlin, 1978). For these reasons the education system in the United States can be termed loosely coupled.

This loosely coupled system has advantages. Weick (1976) argues that loosely coupled systems allow a better sense of local environments and are good for localized adaptation. If the education process requires sensitivity and adaptation to the environment and conditions at the school, local and even state level in which it occurs, then a loosely coupled system may be very appropriate. Reducing the autonomy of actors within the system may reduce their ability to adapt and react to local conditions. A downside to loosely coupled systems is that localized adaptations or any adaptations are slow to spread throughout the system. This slow spreading of adaptation is partially a function of the inability of higher levels within the system to direct lower levels to change their behavior.

## Pressure to Reform

CSR reduction is one of many reform movements within the U.S. education system. The publication of the open letter to the American people titled "A Nation at Risk: The Imperative for Educational Reform" from The National Commission of Excellence in Education in 1983 is seen as beginning a new wave of intensive reform efforts. Citing lower test scores, increased need for remedial training, rising illiteracy, and 17-year-olds with deficits in "higher order" thinking skills, the authors warned of a "rising tide of mediocrity" (National Commission Excellence in Education, 1983, pp. 5). The authors of "Nation at Risk" recommended tougher standards for graduation, college, a curriculum focusing on the basics, improved teaching, and increased funding for education. There has been a steady flow of books and reports since "Nation at Risk" with at least 208 reports published in the following decade, which echoed calls for reform and/or citing various

[8] Political authority is used in this context as opposed to legal authority, which districts derive from the state.

failures of the education system. The end result is that the education system is under "mounting public pressure for significant action" (Boyd & Hartman, 1998 pp. 23).

More recently, calls for education reform have been driven by the perception of a productivity crisis in education (Hanushek & Rivkin, 1997, Odden, 1990). As discussed earlier, the discussion begins with the observation that the resources expended in the United States for education have been continually increasing for the past century. Real expenditures grew at an annual rate of roughly 4% a year with the amount of money spent on education almost doubling between 1966 and 1990. At the same time outputs from the system, measured in terms of test scores, have remained flat (NAEP) or even dropped (SAT).

Of course the perception of a productivity crisis has not gone unchallenged. The focus of most challenges has been on measuring the inputs to the education process, what the money is spent on, the quality of teachers the money hires, and factors at students' homes that affect what students bring to the education system.

If teacher salaries are related to teacher quality, then there may be reason to believe that teacher quality has declined over this period (Hanushek & Rivkin, 1997). Sedlack and Schlossman (1986) show that compared to average earnings for all members of their sex, female and male teacher salaries fell continuously between 1960 and 1980, despite continuous salary increases in real terms over the same period. So while teacher expenditures have risen, they may not have risen fast enough to recruit college graduates of the same quality. This trend has reversed itself somewhat in the last 15 years, but teachers through the 1980s still earned at least 15% less than those in other careers requiring a college education (Ballou & Podgursky, 1998). There also may be differential effects of salary changes on females. Hanushek and Rivkin (1997) argue that to recruit female teachers of the same quality in 1990 as in 1970, teachers' salaries would have to rise by 20%, while recruiting male teachers of the same quality as 1970 would not require a salary increase above current levels.

There is also continuing debate on the relationship between the quality of inputs, particularly teachers, and student outcomes (Freidman, 2000, Ingersoll, 1999, Darling-Hammond, 1999). Most of the research available focuses on the relationship between teacher characteristics and student performance at the secondary level (Feltner, 1999, Goldhaber & Brewer, 1999) although some have included measures of student performance at the elementary level (Ehrenberg & Brewer, 1995, Furguson, 1991). A key question is how to measure teacher quality. Little or no research has linked elementary teachers' credential status with student performance, with some researchers attacking certification as a barrier to entry for quality applicants (Ballou & Podgursky, 1997). Very little research has linked elementary teacher education and test scores with student performance (Furguson, 1991).

There also appear to be changes at home that affect the ability of students from different racial groups to learn. Grissmer et al. (1994) argue that smaller families and better-

educated parents account for a portion of the increased performance (relative to whites) of Hispanics and blacks. He believes the remaining relative increases may be due to school quality. The key point of this work is not the actual effects of different family factors, but that these factors are important and that viewing schools or the school system by test scores alone simply provides an incomplete picture.

The perceived productivity crisis—increased expenditures with decreased or flat performance—has created real pressure on the school system to reform. Unfortunately the pressure to reform has not been meet with agreement as to what is actually the source of the problem, nor on who should be responsible. Instead more detailed examinations of the production process in schools has led to the belief that the issue is much more complex than thought at first blush. With the pressure to reform being felt at all levels of the system, the question is what is the appropriate response at higher (i.e., state and federal) levels.

Policies emanating from higher levels of a federalist system can be rationalized for two general reasons. First they may reflect broader societal norms that may not be present in diverse local jurisdictions. Desegregation of schools is a common example of broader societal norms being imposed on localities against the wishes of, at least some, local policymakers. A second reason for imposing reforms from above is that the reforms will improve the outcomes seen in the system in ways that the localities cannot do themselves. An example of this type of policy is curriculum and textbook standards that reflect the economies of scale when created at the state level instead of on the local level. As will be discussed, the more extreme reforms that move power away from local jurisdictions (Chubb & Moe, 1990, Hill, Pierce & Guthrie, 1997) are rationalized on the theory that the current distribution of authority and power within the system favors the status quo does not allow schools and districts to reform. It is disputable whether the current distribution of power is fluid, so arguing districts' are unable to act can be seen as justifying reforms that may be inefficient or do not reflect societies values.

## REFORM IMPLEMENTATION: A DIFFICULT TASK

*"The effort at school reform is complex because of the multiple actors involved, no single one of which controls all the inputs needed to ensure implementation outcomes. The multiplicity of actors in the system targeted for change and their different levels of authority lead to slow progress."*

Bodilly, 1998

A significant portion of policy implementation literature is based on lessons learned while implementing the federal war on poverty and other domestic programs in the early 1970s. The difficulty of implementing education reforms has been well-documented (Bodilly, 1998, Elmore, 1996, Berman & McLaughlin, 1978, Weatherly & Lipsky, 1978).

Implementation in this case is defined as "carrying out of a basic policy decision" (Mazmanian & Sabatier 1983, pp. 20). This top-down perspective on implementation focuses on the program outcomes as intended by policymakers, not the outcomes desired by those implementing the program at the local or school level. Most discussions of the difficulties associated with reform implementation focus on two factors, institutional relationships and the incentives faced by teachers to change their behavior. Given these difficulties, this analysis looks at three different models of implementation in terms of strategies or rules of thumb to achieve the goals of the programs.

Pressman and Wildavsky (1983) show in painful detail the problems caused by this complexity in their seminal work *Implementation, How Great Expectations in Washington Are Dashed in Oakland; Or, Why It Is Amazing that Federal Programs Work at All, This Being a Saga of the Economic Development Administration as Told by Two Sympathetic Observers Who Seek to Build Morals on a Foundation of Ruined Hopes*. Citing the complexity of working with multiple agencies, the authors found that implementation of a particular economic development program required 70 different agreements. Using simple probabilities, they argued that even with a 99% chance of agreement at every point, the project still had less than a 50% chance of implementation.

Not all activities carried out by schools and districts require as much inter-governmental coordination as local development programs. But as Bodilly points out in the quotation at the beginning of this section, the multiple actors who participate in education reform significantly complicate implementation. The concept of multiple actors goes beyond the four layers of the educational system and includes union officials, reform advocates and experts, and, of course, teachers. Pressman and Wildavsky (1983) suggest that effective implementation is greatly facilitated by modest goals, adequate resources, and unity among the implementing agencies at the local level. The necessity of adequate resources highlights the need for CSR cost estimates in understanding the upper limit of "adequate" resources for CSR and more importantly how "adequate" varies by school.

Bardach (1977) has a similar view to Pressman and Wildavsky of the problems faced in policy implementation. He defines implementation as controlling and directing activities done by multiple organizations and players to achieve program objectives, at low cost and high speed (pp. 250). And he assumes that the very nature of intergovernmental implementation creates a defensive atmosphere where "A great deal of energy goes into maneuvering to avoid responsibility, scrutiny, and blame" (pp. 37). Bardach describes 16 "games" employed by participants in the implementation process that divert resources, deflect policy goals, resist administrative controls, and dissipate energy in game playing instead of constructive programmatic action (pp. 66). Bardach's recommendations for policymakers are to make sure the theoretical base behind policies is strong and to use simple implementation strategies that require as little management as possible. The lesson for policymakers taking a top-down approach is that simple programs such as CSR are the ones that are more likely to succeed.

There has been limited success in synthesizing more general theories of implementation (Goggin et al., 1990). Pressman & Wildavsky (1983) and Berman (1978) give some general advice for practitioners based on case studies. The next section discusses three frameworks for policy implementation with insights that can be useful in thinking about the implementation of CSR. The first two comment on the importance of resources in implementation. The third discusses different policy strategies given different policy environments. All three use many of the same variables in discussing the policy environment and thus are not mutually exclusive in any way; instead they can be thought of as complementary.

**First Framework.** The most complex framework for thinking about policy implementation comes from Mazmanian and Sebatier's 1989 book *Implementation and Public Policy.* This framework is expansive enough to cover most, if not all, factors that affect implementation. This makes the framework complete, but it also makes it very difficult to identify the key ingredients for successful implementation in any given situation. The framework identifies three general variables involved in the implementation process: the ability of the policy decision to structure the implementation process, the tractability of the problem, and non-statutory variables affecting implementation.

A valid causal theory linking an intervention and attainment of program objectives fit under Mazmanian and Sebatier's discussion of policy decisions structuring implementation. Their point, that a valid causal theory is crucial, was raised by Bardach, and remains a critical problem with CSR. Here a useful distinction may be made between implementation of policy decisions and the impact of policy decisions (Montjoy & O'Toole, 1979, Mazmanian & Sabatier, 1989). The addition of classrooms and teachers implements CSR, but the link between smaller class sizes and an impact on student performance is not clearly made.

**Second Framework.** Montjoy and O'Toole (1979) have a much more parsimonious theoretical framework for thinking about policy implementation. Part of this parsimony comes from trying to describe the smaller universe of the behavior of individual agencies to external mandates and do not address intra-government coordination problems. Thus their lessons are most applicable to mandates imposed by states on districts or by districts on schools. They describe policy decisions along two dimensions, (1) the specificity of the policy mandate and (2) the level of resources devoted to the mandate, with support for the mandate within the implementing organization serving as a mediating factor. Mandates that are specific, but with no additional resources, require the support of significant factions within the organization to be implemented. Vague mandates with no resources are not implemented, while agencies facing vague mandates with resources are expected to characterize existing activities as meeting the mandate. Specific mandates with resources are the most likely to be implemented. This fits the California experience with CSR, which had a very specific mandate and resources. It also echoes Bodilly's finding that resource allocation is an important signal to school-level implementers that a certain reform is important. Thinking in terms of the Mazmanian and Sabatier framework

and the Montjoy and O'Toole theory, a key next question in thinking about CSR is the level of resources necessary to cause implementation of CSR.

**Third Framework.** Many authors characterize the implementation process as an interactive process between participants in a policy system (Mazmanian & Sabatier, 1989, Yanow, 1987, Palumbo, 1986, Pressman & Wildavsky, 1983). This interactive process is often termed "adaptive" implementation. Berman describes two implementation strategies, programmed and adaptive, and which of these strategies should be employed based on the policy implementation environment. Programmed approaches use "specific, detailed, and...consistent objectives" to create a "a top-down order" to break through the complexity of joint action (Berman, 1980, pp. 208). This can be contrasted with adaptive implementation that allows policy to be adapted "according to the unfolding interactions of the policy with its institutional setting" (pp. 211). Programmed implementation works to surmount the barriers to fidelity to policymakers' goals through controls to the behavior of those doing the implementation. Adaptive implementation takes a more bottom-up view of program implementation and explicitly argues that the policy goals are to be modified using feedback from those implementing the policy. If policies can continually change based on the views of those implementing the policy, then the goals of a policy are a continually moving target. This means that policies that are implemented adaptively, by definition, will lead to a loss in fidelity to the initially stated intentions of policymakers and be more subject to the "games" described by Bardach. The policymakers' designs can easily be co-opted by those implementing the policies to reflect their interests instead of the interests of the policymakers.

Berman outlines five structural parameters that can be used to determine if programmed or adaptive implementation strategies are called for. He argues that polices with goals that reflect incremental change, with certain technology, with low conflict over goals in a tightly coupled system, in a stable environment, are suited to programmed implementation. Any deviation from these situations, including implementation in a loosely coupled system, suggests the necessity of elements of adaptive implementation for success. Berman found in earlier work that effective education reform strategies promoted "*mutual adaptation*" (emphasis in original) (Berman & McLaughlin, 1978, pp. viii). But adaptive implementation, by its very nature, leads to policy outcomes not envisioned by policymakers. Thus policy making in the education system, an area that is loosely coupled, has low probability of reflecting the goals of policymakers at the top of the system. Either programmed implementation will be difficult due to the nature of the system, or adaptive implementation is required, which can easily lead to diversion and dilution of the policymakers' goals.

The implementation of CSR in California sheds some light on these issues. CSR was successfully implemented in a programmatic fashion despite the loose coupling of the system and the current unstable education environment. This does not invalidate Berman's perspective, but instead shows the importance of the other factors in his

framework. CSR was an incremental change in the process of education, had certain (and relatively simple) technology and low conflict, and it was combined with a large financial incentive, which as discussed by other authors is a crucial factor. Moreover, some of the problems with implementation, including higher costs, are blamed on the lack of flexibility at the local level. The absence of flexibility for adaptation is one of the main criticisms of CSR implementation in California (Bohrnstedt & Stecher 1999).

Several simple lessons for those implementing CSR can be drawn from the implementation literature. First, all reform is difficult and the simplicity of the policy and the uniform support from parents and through all levels of the education system give CSR a distinct advantage. Second, adequate resources are important to implementation. This research will add valuable information on the resources needed for implementation and how the level of resources needed will vary between implementing schools. However, the total cost of implementation is not the amount that states and the federal government need to allocate to induce implementation. Districts could be persuaded to implementat CSR using some type of matching grant.

Finally, implementation of education reform that has strong fidelity to the intentions of policymakers at higher levels of the system is rare. California's CSR implementation is an exception to this lesson in terms of speed and level of implementation. This factor is important when comparing CSR with other reforms. Its simplicity may be an important factor in preventing the co-option of the reform at the local level that is seen with other education reforms

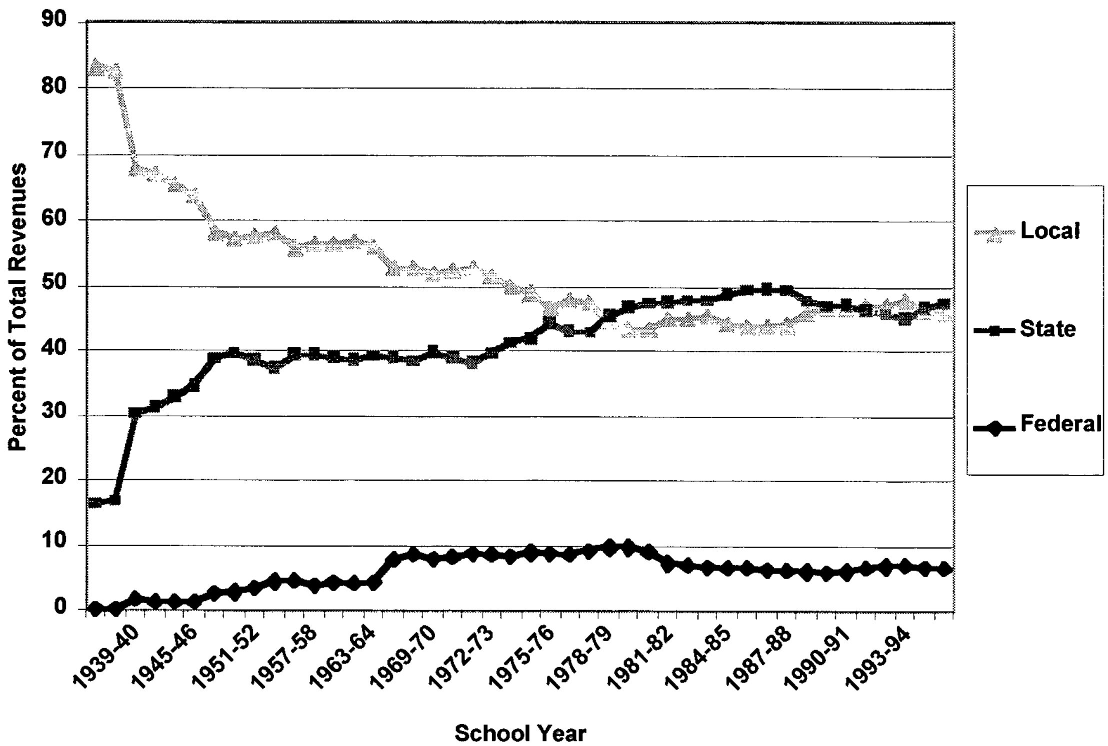
## EDUCATION FINANCE: A KEY ARENA

Financial resources are key ingredients in successful reform implementation. Through resource allocation, policymakers facilitate the reforms by allowing the purchase of necessary inputs and by signaling the importance of a reform to school-level implementers (Bodilly, 1998). Each of the three top levels of the system, federal, state and district, contribute resources that are used in lower levels. Policymakers at each level of the system can direct the use of resources through several different mechanisms. First, the agency providing the resources can restrict the use of resources to a particular activity. A categorical grant and contracts are examples of mechanisms that provide resources for limited activities. Second, the agency providing the resources can use them as an incentive to direct resource use by lower agencies, leveraging the control of resources at higher levels (Monk, 1990). CSR policies often take the form of financial resources either limited to CSR use or as incentives for use of additional resources for CSR. The fiscal environment of the education system is the context in which CSR policy making is occurring. Understanding this context is key to understanding how CSR cost estimates are to be used.

The school finance system can be seen as undergoing two divergent trends that fundamentally change the system of elementary and secondary education funding. These

changes are the centralization of sources of funding and the decentralization of authority to make allocation decisions. The centralization represents the movement of funding responsibility from local school districts to the more centralized institutions of state and federal governments. This change in the source of education revenue is captured in Figure 2.1, which shows the sources of K–12 education funding since 1920.

**FIGURE 2.1 ELEMENTARY AND SECONDARY EDUCATION REVENUE, BY SOURCE**




Source: 1998 Digest of Education Statistics, Table 157, pp. 198

Since the late 1970s, more than half of elementary and secondary education funding has come from the state or federal government. The federal share peaked in the late 1970s and has dropped to a steady 6%–7% of total expenditures for the last 19 years, while the state share has hovered between 47% and 50% over the same period.

The decentralization of allocation decisions can be seen in four systematic reform movements that work to change the relationship between schools and the other components of the system: school-based management (SBM), charter schools, contract schools, and vouchers. Each of these school reform movements seeks to move some of the authority and responsibility for resource allocation decisions from school districts to schools and parents. Each increases the flexibility that school-level managers have in making decisions about what money is spent on at the school level. Each derives at least some of its rationality from the value of shaping schools to meet the needs and desires of

students and parents. By organizing themselves to meet these individual needs and desires, these schools are expected to better fulfill society's educational needs (Odden & Picus, 1992).

SBM places authority for allocation decisions at the school level; parents may have the opportunity to participate in these decisions through school-level decision-making boards. Charter schools go one step beyond SBM by attempting to reduce the influence of local regulations and increase the influence of parents on schools' decision making. Contract schools and voucher systems privatize the provision of educational services and give the providers final say over school-level allocation decisions. SBM, charter schools, and contract schools can easily be operated within a choice system where parents are allowed to signal their support for schools through choosing which school their children attend. Choice systems increase the say parents have in school-level decisions by allowing parents to vote their support for allocation decisions seen at schools by sending their children to the schools that make allocation (and other management) decisions they prefer.

Class size reduction can clearly be seen as part of the centralization of education. Funding for class size reduction flows from federal and state governments for school-level CSR implementation. This leaves relatively little room for local-level allocation decisions, since CSR policy decisions are typically made at the state and federal level.

## Centralization of Education Funding—At the State Level

*"No one ever thought it was the state's responsibility to educate. We thought it was the parents' and the local communities. We're worried about losing local control."*

Donna Styek, New Hampshire House Speaker, 1998[9]

Different forces at the state and federal levels have driven centralization of funding. The two drivers at the state level are tax revolts and demands within the court system for equalization and adequacy in funding across the states. At the federal level, increased educational funding has come in the form of reforms that focus on educational opportunities for disadvantaged populations.

The demands for equalization in funding have been highlighted by court cases that began with the *Serrano v Priest* decision in California in 1972. The U.S. Supreme Court decision in *San Antonio Independent School District v. Rodriguez* (1973) ruled that equality in education funding was not a federal responsibility, which moved the battle over funding equality to state courthouses. By 1998 there had been at least 60 lawsuits in 41 states over education funding equality. These claims moved to state Supreme Courts in 36 states. In 20 out of the 36 cases, the state Supreme Courts ruled against the existing

[9] Stuart, Elaine, "Losing Local Control," *State Government News,* Vol. 41, No. 3, April 1, 1998, pp. 25

state school funding system (Heise, 1998, Reed, 1998). While each state's reaction to school finance litigation was different, court-driven reforms in state school finance systems generally led to increases in state funding for education and increases in the equality in total per-pupil expenditures. The general method used to increase funding equality was to increase state contributions to low-spending districts while holding constant state contributions to high-spending districts. Some states pursued education finance reform without court pressure. However, Evens et al. (1997) argued that state financing reforms in the absence of court pressure were associated with little decrease in inequality and much of that decrease could have been due to increased local revenue raising in low-spending districts.

More recently, state school finance litigation has switched from calling for increased equity to focusing on adequate funding for all students. Heise (1998) argues that this switch is due to disappointment in the level of centralization and increased equality in funding that was produced by equity-based law suits. This also represents a shift from focusing on inputs to the process of education to a focus on outputs of the education system (Odden, 1998, Guthrie & Rothstein, 1998).

A problem with the adequacy argument is the extreme difficulty in defining "adequate." Defining adequate first requires defining expected educational outputs and then determining the necessary inputs to reach this outcome. Three methods have surfaced in determining the necessary inputs: (1) statistical analysis using structural equations, (2) inference through empirical observations of adequately performing schools, and (3) professional judgement (Guthrie & Rothstein, 1998). Each methodology has significant flaws, but the real problem is that the link between financial inputs and educational outcomes is very weak and mediated by a multiplicity of variables, such as student backgrounds and community standards, that are beyond the reach of policy tools. This weak link is one source of the continuing debate on why money matters in education at all. The results of this research will provide information on the inputs necessary for smaller classes. It does not address the question of the educational outcomes of smaller classes.

It should be noted that the drive for equalized funding at the state level has not led to equalized funding on the interstate level. In fact, since the 1970s inequality within states has decreased while inequality among states has increased or at least remains high on several different measures (Parrish, 1996, Picus, 1993, Evens, et al. 1997).

Property tax revolts have also been an important factor in the centralization to the state level of educational funding. The tax revolt began in 1978 with the passage of Proposition 13 in California, with its most recent manifestation in Michigan (1993). The California State House responded to Proposition 13 by shifting the responsibility for school funding from the local jurisdictions to the state level. In Michigan, the property tax revolt manifested itself in the passage of a bill at the state level eliminating all property taxes. Early in the following year, Michigan voters chose between two mixes of new taxes to support schools. Voters selected the plan with higher sales taxes and lower income taxes

(Courant & Loeb, 1997). The end result in both of these states was almost complete centralization of education funding. In other words, control over revenue sources shifted from local school districts to statehouses.

Increased centralization of funding reduces local control of revenues and can lead to loss of local policy control. Heise (1998) argued that increased centralization was the goal of litigants because they believed that centralization would reduce inequality. At the state level, school spending is in direct competition with other discretionary programs. Increased centralization may actually lead to decreases in overall state aid to education (Figlio & Rueben, 1998, Figlio, 1996). California voters passed Proposition 98 in an effort to protect education's share of state discretionary funding. Proposition 98 mandated the funding increases that were used by Governor Wilson to fund CSR in California. CSR was a way for the Republican governor to meet the mandate without allowing for the teacher salary increases that would have been facilitated by a general increase in education funding. Increased centralization may also lead to more volatility in education funding because statewide sources of revenue, sales and income taxes, are generally more volatile than local property taxes (Heise, 1998, Courant & Loeb, 1997, Theobald & Picus, 1991 ).

The general theory behind loss of local policy control is captured in the phrase "He who pays the piper calls the tune." Local control manifests itself in control over such items as curriculum, expenditures, personnel practices, and pay. While the theoretical support for loss of local control with state funding has great face validity, early studies found few relationships between state education expenditures and state control (Pincus, 1974). More recently, state-level case studies have been used to show loss of local control. Heise (1998) offers two examples of states that have extreme centralization. Hawaii has always funded education using state revenue. The power of the purse has given the state general assembly "enormous control over education policy and governance matters" (Heise, 1998, pp. 561). Centralization of financial control in California was finalized with the passage of Proposition 13 in 1978 (Kirst, et al., 1995, Picus, 1991). Centralization of policy control has also occurred. A bill passed in 1982–1983, SB 813, was the first instance where increases in state funding were directly tied to reform by districts (Picus, 1991). By 1986 local school boards operated under the supervision of over 3,500 state statutes and 800 State Board of Education regulations (Guthrie & Kirst et al., 1988).

## Education Funding by the Federal Government

State roles in education derive from their primacy over local jurisdictions; many state constitutions require states to provide education for their citizens. Federal legitimacy is more tenuous in that the 10th amendment appears to relegate responsibility for education to states.

Federal funding and regulation of education have focused on boosting assistance and services offered to populations with special education needs that were likely to receive

insufficient help from the regular school systems. These populations include handicapped students, low-income students, and immigrants' children. While these programs have clearly highlighted the needs of children in these specific groups, they have been of doubtful efficacy. They can be seen as fragmenting schools and school districts into programs that are delivered to different groups of children. The 1994 ESEA reforms allowing schoolwide projects may be reducing fragmentation (Levitan & Gallo, 1993, Hill, 1999) These federal programs reflect broader societal goals that are not likely to be incorporated in local decision making.

Local control is clearly important if schools and communities need to modify education programs to meet the specific needs of local students. Hill (1999) has also argued that loss of control over local programs reduces the organizational capacity of schools and districts to provide the services students need. The key question is not all or nothing, but rather the correct balance within the educational system of local control and central control. This balance must meet taxpayer demands and societal concerns, and produce an education system that is able to educate students in an equitable and efficient manner.

Because of the centralization of funding for education programs, state and federal policymakers are an important target audience for this research on cost of CSR. This cost information is intended for use in designing implementation plans. Information on district-level characteristics will allow policymakers to craft funding schemes that will limit differences between costs and reimbursements. This will limit the windfalls to districts where reducing classes is relatively easy and increase funding for districts with conditions that make CSR more difficult. The analysis will also allow policymakers to understand the burdens placed on schools and districts if they choose to incompletely fund CSR. With an understanding that more complete levels of funding facilitate implementation, policymakers can then set realistic expectations for implementation.

If states and the federal governments have an increased role over educational programs at the local level, as reflected in the example of CSR, then state and federal policymakers should expect to be held more accountable for educational outcomes. Each programmatic directive from higher levels in the educational system can be seen as reducing the ability that local- and school-level implementers have to control the services they provide. With less control over programs, it is difficult to hold local education officials' responsible for program outcomes.

## DECENTRALIZATION OF POLICY DECISIONS

While sources of funding have been recently centralized to states, there have been multiple reform movements that seek to decentralize allocation decisions to the school level, and to involve not just principals, but teachers and parents in those decisions. These movements are (listed from most district control to the least district control): school-based management, charter schools, contracts, and vouchers.

The early forms of the increasing parental involvement in school-level decisions can be seen in the 1965 ESEA where parent-run councils were given veto power over school-level plans for the use of federal funds (Levitan & Gallo, 1993). The inclusion of teachers in school-level decision making gained support from the effective schools research in the late 1970s and early 1980s. This body of research generally found that teacher participation in school-level decisions was a key ingredient to effective schools (Purkey & Smith, 1983). By the middle of the 1980s, open school decision making, i.e., decision making by groups of stakeholders, had become a conventional way of viewing school management. This open decision making can be part of school-based management (SBM), which was termed the second wave of education reform (Odden & Picus, 1992).

There are three general reasons for increasing control over allocation decisions at the local level. First, it gives schools flexibility to craft their educational program to meet the needs of children in the school (Heise, 1998, Clark & Toenjes, 1996, GAO, 1994, Hill & Bonan, 1991). It is assumed that the flexibility will be used to increase the school-level focus on children and decrease the focus on programs. A second reason is the finding in effective schools literature that teacher participation in school-level decision making and reforms increased their participation in reform and the likelihood of success (Purkey & Smith, 1983). A final reason for increasing the school-level participation in decision making is distrust of the district- and state-level decisions to serve the educational needs of students (Hill, Pierce & Guthrie, 1997, Chubb & Moe, 1990).

Those who support school-level decision making because of distrust are extremely critical of the current education system. Their stated intention is to use school-level decision making to reduce the power over schools and programs that districts, states, and the federal government currently exercise (Hill, Pierce & Guthrie, 1997, Chubb & Moe, 1990). Malen (1994) has an interesting counterpoint to this perspective. She argues that SBM can actually be used to bolster school districts' legitimacy and ability to manage conflict. SBM does this by diffusing conflict from the district to the school level and by appearing to be responsive, democratic and innovative. From this perspective, efforts to redistribute power from districts' central offices may actually result in renewed legitimacy for the central office, which is opposite to the goals of those who distrust state and district authorities.

A key element to the success of all of these decentralization efforts is creating a structure that allows the identification of high and low quality in school performance (Hill, Pierce & Guthrie, 1997, Robertson, Morhman & Wohlstetter, 1995, Hill & Bonan, 1991, Chubb & Moe, 1990). Two general mechanisms are used to identify high-quality schools. First, a performance measurement system can be used that specifies a set of performance areas that schools are to be measured on and specifies the measuring tools, i.e., test scores, dropout rates, etc. Second, through choice mechanisms parents are allowed to choose which schools their children attend and in essence vote through attendance. These two methods are not mutually exclusive and can be used together as part of a quality-identification system.

There is little agreement on how high-performing schools should be rewarded and how low-performing schools should be aided or sanctioned. More importantly, school districts and states have a hard time sustaining performance measurement systems or effective choice systems. This calls into doubt the effectiveness of this general line of reform. For example, Herrington (1996) found that over a 20-year period the State of Florida was able to create active testing and management information systems but was unable to complete the research and development necessary to hold schools accountable. The Florida system deregulated schools and districts and mandated school-level decision making, but was unable to do the work necessary to evaluate schools. However, a recent examination of state-level accountability efforts in Texas and North Carolina argued that these systems contributed to improvements in student performance (Grissmer & Flanagan, 1999).

SBM is loosely defined as a system that promotes "greater school-site autonomy over some combination of budget, personnel, and program decisions" (Odden & Picus, 1992). The role of parents and teachers can vary from none to active membership in school-level decision councils.

The literature suggests that schools will be more effective at allocation of resources than districts. Odden (1992) argues that "school-based finance systems" can make better resource allocation decisions than the central office in terms of meeting the schools' and the students' needs. Wohlstetter and Buffett (1992) argue that SBM, in theory, should provide "greater efficiency in allocating resources." Miles and Darling-Hammond (1997) argue that when schools are allowed to rethink their resource allocation they can allocate their resources in more effective ways than the central office. Despite these theoretical arguments, there has been little evidence of the effectiveness of SBM in improving student performance. A limited set of case studies has shown that a SBM district was less effective at providing teacher time for school-based reform (Purnell & Reichardt, 1999). Hanushek et al. (1994) observe that very few SBM implementation plans include improving student performance as a goal, with some instead using the less specific goal of "school improvement."

Charter schools work to reduce district and state control over school operations and increase school-level control by operating outside of most current regulations and contract rules. These schools are often operated under some sort of performance contract system that specifies the outcomes these schools are to accomplish in exchange for being free of the current regulatory systems. There has been tremendous growth in the number of charter schools, with the number increasing from 700 to over 3000 between 1992 and 1999 (Aug 29, 1991, *L.A. Times*). There is limited information on the success of charter schools (Rothstein, 1998).

Chubb & Moe (1990), and to a lesser extent Hill, Pierce & Guthrie (1997), argue that the organizational structure of the education system prevents effective management. They take the argument made above that centrally directed reform is difficult one step further. They argue that it is impossible because political support for the status quo is too strong

to overcome. Hill, Pierce & Guthrie (1997) argue for redefining the roles of actors in the current system to create a contract school system. In this system parents would have school choice and the role of the school board is to manage school contracts. This reform moves control over the use of funds from the current institutions into the hands of school contractors. School boards would still have policy control over school operations through the contracting process. Thus school districts would have a modified fiscal management role and would have wide discretion over setting policy.

Chubb & Moe (1990), and Hill, Pierce & Guthrie (1997) express doubts about the ability of the existing system to reform itself. They characterize it as rule bound, bureaucratic and process driven. Instead of working within the existing system, Chubb and Moe argue for a voucher system that moves much of the policy making authority to the school level. Under the system advocated by Chubb & Moe, as well as other voucher supporters, parents with vouchers decide on the amount of funding allocated to a school through enrolling their children in a school. Schools are then given wide discretion over how this funding is spent. The districts' role is to support school choice and potentially provide services in response to school-level requests. Voucher systems result in decentralizing control over sources and uses of school resources and are a relatively extreme example of school reforms that decentralize school finances.

All of these decentralization reform movements seek to decrease the control districts and states have over school-level operations and increase the role and responsibility of schools in implementing school-level programs. These reform movements may lessen the ability of states and the federal government to impose reforms like CSR. They increase the need for understanding both the pecuniary and non-pecuniary school-level costs of CSR. School-level budgets have less flexibility than district-level budgets simply because they are smaller. When districts are asked to implement reforms across several schools, they are able to balance the demand for resources across schools and lessen the impact of high costs on any single school. If schools are to be the units responsible for implementing reforms, they will have less financial cushion.

Finally, if authority for programs moves to the school level, while responsibility for funding these programs moves to the state level, who is responsible for school-level outcomes?

## CONCLUSIONS

*"The issue is how the finance system that is focused on inputs can be reconstructed to reinforce and education policy agenda that is focusing on results and outcomes, largely produced at the school."*

Odden & Clune, 1995

The education system in the United States is a complex and dynamic system. There are at least four institutional levels that participate in the formulation and implementation of

educational policy. Each level is relatively independent, so when policies are formulated at the upper levels of the system, it makes implementation at the school level very difficult. The school finance system is changing, moving the responsibility for providing for education to higher levels in the system. At the same time many reform movements are arguing for moving the power over resource allocation to the school level.

In this setting, understanding the costs of CSR is important for several reasons. First, it is an important ingredient in facilitating implementation of the reform. Adequate funding for reforms is vital to successful implementation. States need to understand how costs vary across schools and how to allocate adequate resources to districts to fund the reform. As responsibility for resource use decisions moves to the school level where there are arguably few slack resources, schools must be completely reimbursed for CSR if they are expected to be able to implement the reform. Alternatively, if states are unable to fully fund the program, then they can set realistic implementation expectations based on the incentives provided by their funding level.

Understanding the costs of CSR is also important for the efficient use of resources. Understanding the school-level factors that affect the costs of implementation will allow districts and states to completely fund CSR without creating windfalls.

There is a tension between the centralization of funding sources and the decentralization of allocation power. It raises the age-old question within the federalist system of balancing control to maintain group mores, allow individual preferences, and create an efficient, effective system (Monk, 1990). With these fundamental changes in the education system, one can consider the appropriate role for each player. Rivlin (1992) raised this question in the early 1990s for all the duties currently under state and federal jurisdiction. She argues for a cleaner distinction between state and federal roles. She suggested that the federal government reduce its policy role in most domestic issues, except to provide adequate and steady funding for maintaining the social insurance systems and to address interstate issues such as pollution. She explicitly singles out education as a state role based on the need to adapt education reforms to local conditions. She recommends that the federal policy making bodies turn most of their focus to international issues, which she expected to become more complex. Rivlin believes this distinction between roles will reduce voter confusion about who is responsible for what public functions and energize the economy.

The California LAO addressed the issue of appropriate roles for education in its Education Master Plan (Hill, Elizabeth 1999). Here, as in Rivlin's recommendations, the higher levels of government were expected to reduce their policy roles, while continuing to provide adequate, steady resources. The LAO also envisioned the policy role for the state as setting expectation parameters for the performance of schools and districts and creating an accountability system for meeting these expectations.

When roles and responsibilities are specified, the responsibilities facing education policymakers at each level change from a general to specific. The functions that

policymakers are responsible for should be directly related to the functions those policymakers can affect. Despite the successes of CSR implementation in California, there is little reason to believe that policymakers at the state and federal level can easily, or quickly, direct change at the school level. Thus the responsibilities for those at the upper levels should not be school-level education program management. Instead the role of upper levels should be used to reflect societal norms and create a structure that clearly outlines performance expectations for the rest of the system.

While trends in education finance appear to be moving in opposite directions, we may actually be moving toward a type of "loose-tight coupling" (Boyd & Hartman, 1998). In this system the upper levels of the education system set expectations for the performance of the lower levels and play a role in the funding of the system. The lower levels are then held accountable for meeting those goals. This is similar to the ideas espoused by Osborne & Gaebler (1992), with the states' role including standard setting and information gathering. This information is used to measure local performance and hold localities accountable.

The system can be seen as evolving from one that focuses on control to one that sets expectations for and measures outcomes. Schick argues the purposes of budgeting systems are control, management, and planning. Control functions relate to the legal execution of budget allocations and are associated with line item budgets. Management systems focus on the efficient operation of programs and are associated with program budgeting systems. Planning systems focus on the outcomes of policy systems and are associated with the planning programming budget systems (PPS) that were implemented in the early 1970s. While every budgeting system accomplishes elements of control, management, and planning, they can accomplish only one aspect well (Schick, 1980). In our multi-level education system, it is possible that one level should focus on management while another, higher level, focuses on planning. The higher levels direct their resources and structure their internal systems with a focus on program outcomes, while the lower levels focus on program efficiencies.

How does CSR fit into this vision of the education system? CSR policies can be seen as a step in setting expectations for the management of schools and providing some funding for meeting those goals by higher levels in the system. As discussed in the first chapter, class size is not clearly linked to student performance and thus is not the optimal parameter to be specified in a performance management context. But it could be considered an important process variable to measure in discussing equity across schools, and as a process variable is an improvement over simply measuring inputs. Specifying class size could be an intermediate step in an education system that does not currently have many effective systems for measuring outcomes. If those measurement systems come into place, and are effectively used (Herrington, 1996), limits on class size may no longer be important. But until that system comes into place, CSR policies may be one of the more effective tools states have for monitoring and changing school performance in a way that is, at least loosely, linked to student outcomes.

# CHAPTER 3: THE DOLLAR COST OF CSR

*"Still, reducing class size holds real appeal. It is one change that can be made without training, follow up, and continued maintenance."*
Slavin, 1990

## INTRODUCTION

This chapter contains an analysis of the school-level dollar cost of CSR. AThe purpose of this analysis is to help policymakers understand the relationships between policy choices and costs. This analysis builds on existing literature with additional information on school-level costs and explores new combinations of policies and existing conditions and their cost implications. The policy choices being addressed are:

- The decision to implement or not implement CSR?

If CSR is implemented, how to structure the policy in terms of:

- What is the class size goal?
- How class size is measured?
- How many students should be affected by the policy?

The implications of these policy questions are summarized by four simple "rules of thumb" that can be used to estimate the school-level costs of CSR.

This chapter has four parts. It begins with a description of the data and methods used in the chapter and progresses through three sections. The first section uses a simple hypothetical model to gain a better understanding of the relationship between costs, existing conditions and policy choices. The second section uses simulations of CSR in seven Florida school districts to examine the cost implications of the five policy decisions outlined above with CSR implementation. This examination includes analysis of the effects of alternative space and staffing choices on the cost of CSR. The third section uses regression models to provide rules of thumb about the cost of CSR that can be applied to policy situations outside of the Florida sample.

## DATA AND METHODS

A program's costs are the resources consumed in implementation and are then unavailable to be used in other programs. The costs discussed here are those with a market price, and thus can be discussed in dollars. This is appropriate since there are markets and prices for most of the resources used in CSR (Drummond, O'Brien, Stoddart and Torrance 1997,

1978, Levin, 1983, Sugden and Williams, 1978). The largest component of CSR costs are teachers' services, which are purchased with dollars paid in the teacher's salary.

The goal of the Florida simulation is to provide the marginal cost of implementing a program. That is, it provides estimates of the additional resources used to implement the policy. These costs are the average marginal cost the schools in the sample districts.

To allow comparability among CSR policies, the additional effort needed to implement CSR is presented as cost per student in the grades to be reduced. A simple and widely applicable measurement of the marginal resources needed to implement CSR is the additional number of classrooms. In other words, the basic unit of cost in this analysis is the classroom. Classrooms may contain different bundles of ingredients, depending on district policies and circumstances on such matters as teacher salaries, the use of aides, and the cost of heating and cooling.

To calculate the cost per student for a policy, the number of classrooms needed to implement the policy is divided by the number of students sitting in the classrooms, resulting in the intermediate measure, classrooms per student. Classrooms per student is the cost measure used in the hypothetical model. Classrooms per student are multiplied by the total price of the resources needed for a classroom to reach the final cost per student.

A key issue for individual districts is the space used to for new CSR classrooms. This issue is complicated for individual districts by their available space, and future demands for classrooms associated with changes in enrollment. This space has some shadow price (i.e. non-market price) that is not discussed in this analysis. The costs reported in the rules of thumb assume the new classrooms are in leased relocatable classrooms. This assumption allows the rules of thumb to be a baseline price that schools and districts can modify according to their own circumstance. Price estimates for new classrooms and purchased relocatable space are provided (see Table 3.5 and Appendix 3) to facilitate consideration of alternative sources of new classroom space.

## Data

The data described below were used in the Florida simulation. The data are drawn from a variety of sources, most from various offices inside the Florida Department of Education. Florida was selected for use in the simulation because of the availability of good school-level data on staffing, enrollment, facilities, and school performance.

As described in Nakib (1996, 1994), as well as Nakib & Herrington (1998), the Florida Education Finance Program (FEFP) is a comprehensive and detailed centralized funding system that was initially adopted in 1973. The FEFP and the associated accountability system require the state to maintain detailed information on school-level enrollment, staffing, and facilities. The data are maintained in three separate databases, with the staffing and enrollment databases becoming functional in 1992–93. Beginning in 1996–97,

the state also began publishing and releasing on the world wide web (web) Florida Indicators Reports (Indicators), which provide summary information on school enrollment, staffing, performance and expenditures. In 1997–98, the Florida Department of Education gathered data on the class size in K–3 classrooms by school in response to a legislative request. These five databases (enrollment, staffing, facilities, Indicators, and Florida Class-Size Reports), plus the Common Core of Educational Data, School-Level database are the sources of data for this work. Details on the data used here are contained in Appendix 1.

Because of the complex and time-consuming nature of merging data from these five different databases, a sample of Florida school districts was used. School districts in Florida are countywide. The school districts that were selected are Alachua, Broward, Dade, Hillsborough, Pinellas, Santa Rosa, and Wakulla. The districts were selected in consultation with database managers to be geographically and socio-economically diverse, as well as to contain districts that generally were reliable in providing input to the state databases. This sample includes four of the larger districts in the state (Dade, Broward, Hillsborough and Pinellas), a medium-sized district (Santa Rosa), and two smaller districts (Alachua and Wakulla).

During the summer of 1998, the Florida Department of Education provided detailed raw data from the staffing, enrollment, and facilities databases for all elementary schools for the seven school districts. Each (staff, enrollment, and facilities) consisted of text files, with different layouts. The enrollment and facilities data required extensive reformatting prior to the analysis.

Each of the five data sets contained a slightly different set of schools. The end result is a final data set of 535 schools with enrollment, staffing, and class size data. Details on how the data was merged and which schools were not included are in Appendix 2.

## Prices[10]

Initially estimate the marginal resources needed to meet the policy goals measured in classrooms per student. To show how variation in prices among districts can lead to large variation in costs between districts, prices for resources used in classroom are added. The resources used in this work for all new classrooms are teachers, substitutes, aides, a leased relocatable classroom, teacher furniture, utilities, and maintenance. The most appropriate price estimates are the marginal price of purchasing one more unit of each resource (Levin, 1983). In some instances, for example utilities and maintenance, the only price estimates available are the average cost of providing those services within the district.

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[10] Prices are established in a market of buyers and sellers. The prices discussed here are for goods sold to school districts. Because there are few school districts in a given area, there are few buyers for the goods, and the market may not be perfectly competitive for goods that are not easily transportable. See Drummond, O'Brien, Stoddart & Torrance, 1997.

Details on how the prices were derived are contained in Appendix 3. Table 3.1 shows the prices used in the analysis.

**TABLE 3.1 CLASSROOM COSTS USED IN SIMULATIONS**

| District | Teacher Salary & Benefits | Aide Salary & Benefits Per Teacher | Leased Relocatable Classroom | Operations, Maintenance & Utilities Cost | Total |
|---|---|---|---|---|---|
| **Alachua** | $32,911 | $1,791 | $6,000 | $3,601 | $43,103 |
| **Broward** | $38,570 | $3,655 | $6,000 | $4,722 | $51,747 |
| **Dade** | $37,674 | $11,069 | $6,000 | $6,378 | $59,921 |
| **Hillsborough** | $33,251 | $4,533 | $6,000 | $3,824 | $46,408 |
| **Pinellas** | $33,117 | $5,015 | $6,000 | $3,817 | $46,749 |
| **Santa Rosa** | $31,022 | $4,894 | $6,000 | $2,997 | $43,713 |
| **Wakulla** | $33,782 | $5,645 | $6,000 | $3,862 | $48,089 |

The average costs used in this report is $53,000, which is a weighted (by school) average.

**Teacher Salaries**

The teacher salaries are expected to reflect the price districts would have to pay for new teachers to reduce class sizes. The cost of a teacher is the teacher's salary and benefits package and can vary considerably based on a teacher's experience and education levels. Details on the derivation of the teacher salaries used here are in Appendix 3.

Table 3.2 shows the salary price ranges to be used in this work. Note that for several districts the low and median estimates are the same. This indicates that the distribution of salaries is skewed to the right. This skewness indicates that the mean and standard deviation would overstate the variation in the salary range of potential new teachers for these districts, because of the influence of outliers.

TABLE 3.2 SALARY OF NEW TEACHERS IN THE SAMPLE

| District | 25th Percentile Low | 50th Percentile Median | 75th Percentile High |
|---|---|---|---|
| Alachua | $ 30,856 | $ 32,911 | $ 33,649 |
| Broward | $ 38,038 | $ 38,570 | $ 48,957 |
| Dade | $ 37,441 | $ 37,674 | $ 42,361 |
| Hillsborough | $ 33,251 | $ 33,251 | $ 35,910 |
| Pinellas | $ 33,117 | $ 33,117 | $ 35,777 |
| Santa Rosa | $ 31,022 | $ 31,022 | $ 37,475 |
| Wakulla | $ 30,743 | $ 33,782 | $ 36,801 |

**Operational Costs: Aides**

Costs for classroom personnel may also include an additional average cost per classroom for aides. While additional classrooms may require additional aides, based on school staffing decisions, it is assumed that additional classrooms do not require other administrative or support staff such as principals and counselors. This is based on the assumption that assignment of these personnel are based on enrollment or the existence of a school and not on the number of classrooms.

The initial cost of aides is estimated to maintain aide usage at the same intensity and salary level as was found in each district's elementary schools in 1997–98. Later analysis will examine the effects of different policy decisions on aide staffing.

**Prices for Classroom Space**

Additional classroom spaces can come either from current space that is not used for classroom purposes or from new classrooms. The analysis contained in this chapter assumes leased relocatable or portable classrooms are the source of new space. Appendix 3 contains information on the cost leased space. It also contains information on purchased classrooms that can be used to calculate the cost of CSR if new permanent schools or classrooms are used[11]. The prices used here is $4,800 per year for leasing a relocatable plus an estimated $1,200 for teacher equipment.

**Utilities and Maintenance**

The Florida Department of Education collects district-level cost data for operations, maintenance and utilities of all facilities in each district. Operations costs are driven by custodial services. Upkeep and repair of rooms drive maintenance costs, and energy costs

[11] The decision whether new schools should be built is not addressed in this work. This decision is the function of many local factors that are beyond this work such as geography, demographics and development goals, and requires analysis more focused on local issues than this work.

are for lighting, heating and cooling. The cost data can be used in estimating the cost of operating new classrooms that are built for CSR.

## Methodology

The key issue for estimating this cost marginal cost of CSR is determining the existing number of classrooms and the number of classrooms needed to reach the class size goal. The difference between the existing number of classrooms and the number needed to reach the class size goal is the additional number of classrooms needed to implement CSR. The cost of CSR is simply the additional number of classrooms times the price of a classroom.

Determining the number of classrooms is relatively straightforward using information on class size and enrollment. An important factor is that classrooms come in whole units, i.e., a school cannot add a fraction of classroom (or teacher) to reach a class size goal.

### The Ceiling and Target Class Size Measurement Options

The methods used to determine the number of classrooms needed to reach a given class size goal for the hypothetical model and the simulations are the same. Two different policy options for measuring class size are used. The first will be called the ceiling option, and the second will be called the target option. These two options are similar to the "base" and "flexible" policies seen in Brewer et al. (1999).

The ceiling option simulates the California policy where the class size goal is a class size ceiling of what the largest size classes can be. The total number of classrooms needed to reach the class size goal using the ceiling option is determined by rounding the quotient of enrollment divided by class size goal up to the next whole number.

The target option simulates a more flexible policy where schools minimize the difference between their actual class size and the target class size. The target policy simulates the decision mechanism for allocating new teachers described by a superintendent in a small Florida district. In this district, principals were allocated funds to meet district-wide class size goals. If the sum of students above the class size target across a grade equaled 51% of the class size target for that grade, then the district would allocate another teacher to that school. For example, assume the class size goal is 20, and in year one a school has 40 students with two teachers. This would produce two classes that exactly meet the class size goal of 20 students in each class. Assume that in year two that same grade had 51 students. With two classrooms the sum of the students over the class size goal would be 11. Eleven students over the class size target would be 55% of the class size goal. This is past the 51% tipping point and the school would be allocated another teacher. The total number of classrooms needed to reach the class size goal using the target option is determined by rounding the quotient of enrollment divided by class size goal to the nearest whole number.

### The Existing Number of Classrooms in the Florida Simulation

Determining the existing number of K–3 classrooms in the sample of Florida schools proved to be a challenge. Several methods were attempted. The first method was to use teacher assignments from the staff database to determine the number of classrooms per grade. This method proved unworkable because of the lack of information on the number and grades taught by Title 1 teachers teaching regular classrooms and the grades taught by mixed-grade teachers.

A second potential approach was to use the reported average class size for schools found in the Indicators reports. The Indicators reports give the average class size for grades K–5 in a school. While this approach is reasonable, it was not optimal for several reasons. First, this methodology would lead to averaging class sizes across schools and would not capture grade-level variations in class size. Second, the definition of class size provided with the Indicators did not clearly exclude special education classes and other pull-out classes, which leads to suspicions that the methodology of determining class size could vary across schools or districts and would not reflect the class size experienced by the average student. Given the difficulty in measuring class size, as described in Chapter 1, it seemed likely that schools used different methodologies varying from using pupil-teacher ratios to actually counting the number of regular classrooms serving each grade. An interview with a school principal revealed that the mechanism for verifying accuracy in Indicators class size was parental complaints. The principal explained that if schools reported class sizes in the Indicator reports that were significantly different from what their children experienced, then parents would complain, leading to correction of class sizes.

This suspicion of inaccuracy in the Indicators class size was increased when the Indicators data was compared with the estimated minimum possible class size based on the staffing and enrollment data. A total number of potential regular K–5 teachers was estimated based on teacher assignments in the staffing data. This pool of total teachers includes Title 1 teachers, those assigned to mixed classes, and those with indeterminate assignments, but did not include special education or specialist (music, art and PE) teachers. Not all of these teachers are expected to be teaching in regular classrooms. Dividing the number of potential teachers into the K–5 enrollment produces an estimate of the minimum possible class size given the number of teachers assigned to a school. In 35% of schools, the Indicators class size was smaller than the minimum class size that was possible given the number of potential K–5 teachers. The difference between the Indicators class size and the estimated minimum possible class size was larger than one in 29% of the schools for the entire sample and 68% of the schools in Dade County.

There are multiple potential reasons for this difference. One is that the assignment of teachers to grades and schools in the staffing data could be incorrect. Clearly this is the case for one school in Dade County that had zero teachers assigned to it. Equally reasonable is that the Indicators class size was measured when enrollment was at a minimum for a school year, thus minimizing the reported class size. An extreme example was related by a principal whose enrollment fluctuates by 30% during the school year due

to farm worker migration. The number of teachers assigned to the school is relatively static, leading to large changes in the class size. Depending on when class size was measured in this school, the reported class size could vary by 20–30%. Equally probable cause is the use of special education, specialist and other non-regular teachers to calculate the Indicators class size. This would bias the Indicators class size down from the class size experienced by the majority of the students in a school. Regardless of the reason, the difference between the Indicators class size and the estimated minimum possible class size cast doubt on the accuracy of the Indicator class size.

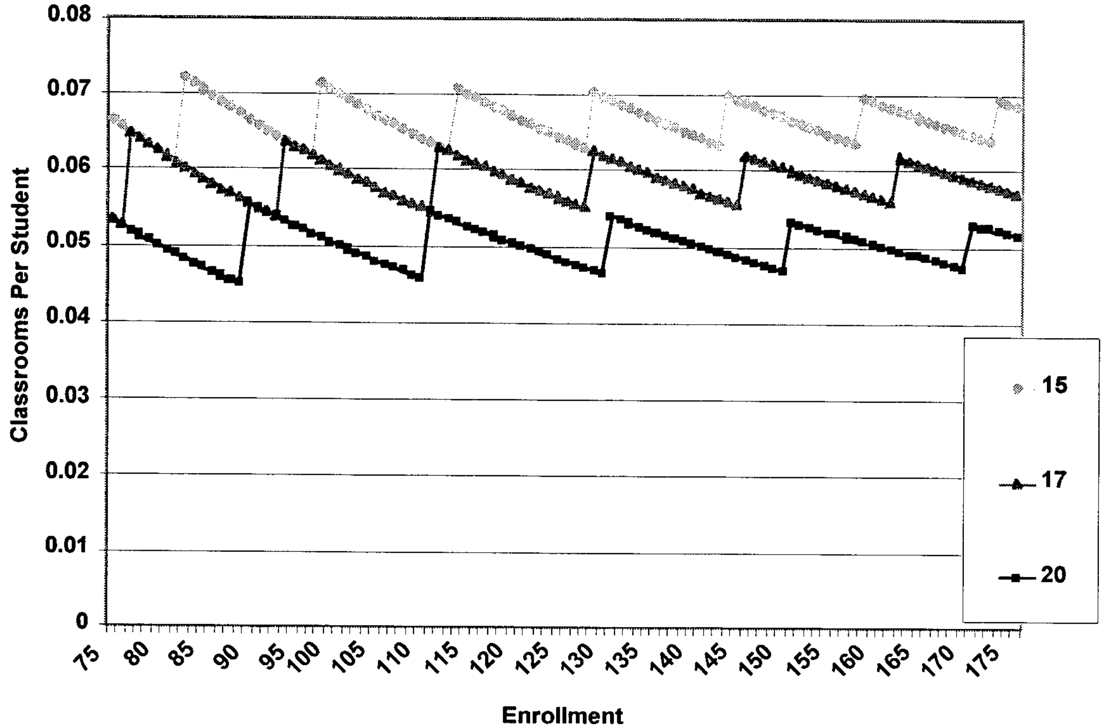
A more precise and accurate source of class size information is data gathered by the Florida Department of Education in response to a request from the Florida Legislature. The request was for a count of "regular" classrooms by grade and enrollment for grades K–3. There were two complications with these data. First, the request did not include mixed-grade classrooms and thus does not provide the true number of classrooms for schools that have mixed-grade classes. Second, the data were gathered in January 1998, and thus may have different enrollment information than what is contained in the Automated Student Information System, which was collected as of October 1, 1997. This data provided the class size and enrollment for some (or all based on potential use of mixed-grade classrooms) students in January, and the enrollment data provided a count of all students in October. To resolve this issue, an integer program optimization was applied that estimated a count of classrooms by grade by minimizing the difference between the class size reported in the legislative request and the estimated class size using the October enrollment data. The final number of classrooms by grade was assumed to be the larger of either the number estimated from the optimization or the number reported from the legislative request. As discussed above, the enrollment data from the Automated Student Information System was the final enrollment data used, unless the class size data reported enrollment for a grade that did not have enrollment in the Automated Student Information System.

## RESULTS SECTION ONE: HYPOTHETICAL MODEL

This section uses a hypothetical model of the classrooms per student required to meet policy goals to provide a basic understanding of the CSR cost function. Classrooms per student are a universal measure of CSR costs and are simply the inverse of the actual class size. The final cost of CSR is simply the price of a classroom times the classrooms per student.

Figure 3.1 shows the classrooms per student required to maintain three different class sizes (15, 17, and 20) using the target method of enforcement.

**FIGURE 3.1 CLASSROOMS PER STUDENT REQUIRED TO MEET DIFFERENT CLASS SIZE GOALS USING THE TARGET METHOD**




This figure illustrates three intuitive points about the relationship between costs and class size, where classrooms per student represents costs. The most obvious point is that the number of classrooms needed increases as class size decreases. The average number of classrooms per student needed to maintain a class size of 20 is about .05, while the number of classrooms needed to maintain a class size of 15 is closer to .067.

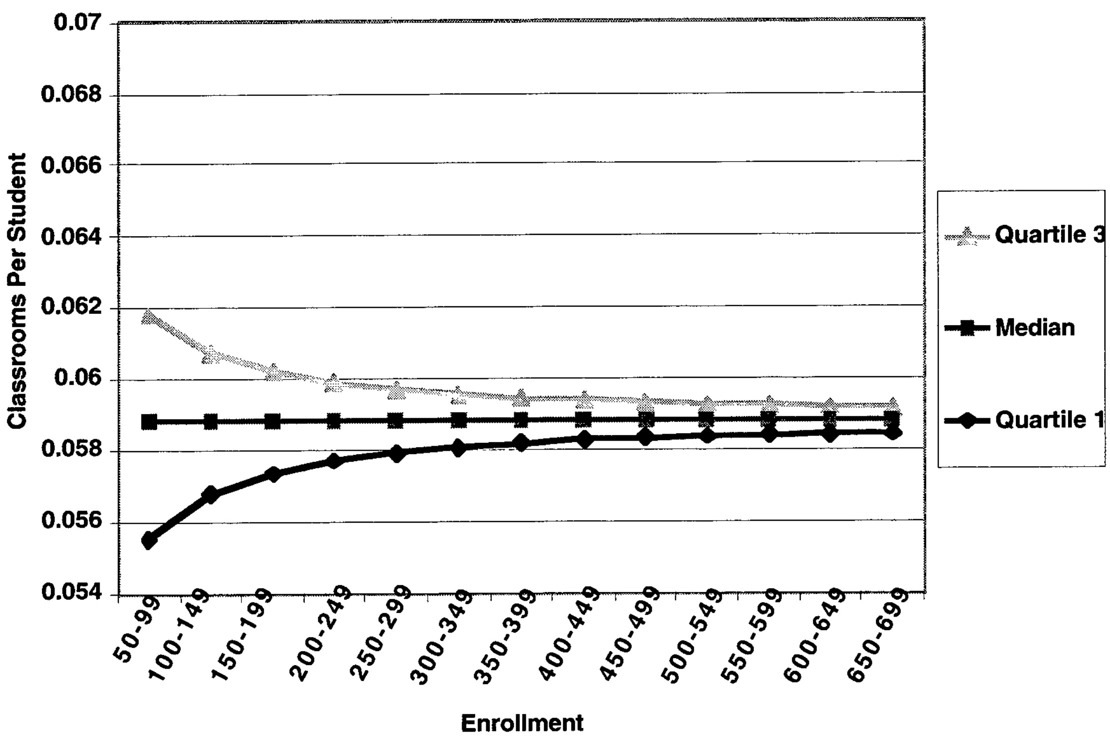
Second, costs cycle from a high cost (at an enrollment level that is one plus some multiple of the class size goal) down to a low level (at the next multiple of the class size goal). This reflects the simple relationship that when enrollment reaches some "tipping point," an additional classroom is needed. This additional classroom is averaged across all students. An increase of 1 student can move costs over a tipping point from the lowest costs to the highest costs. In the case of a class size goal of 20, an increase of 1 student from 80 to 81 students required the addition of another teacher and increased costs by 24% when classrooms per student moved from a low of .05 to a high of .062.

A final, related, observation is that as enrollment increases, variation decreases. Increasing the number of students spreads the costs of an additional classroom across more students. With a class size goal of 15 using the ceiling method, when enrollment moves from 15 to 16, a school must add another teacher and the cost of each teacher is spread over 8 students. The next tipping point is at 31, when the school must have 3 teachers. Here

the cost of each is spread over 10 students, which is a 25% reduction in classrooms per student compared to an enrollment of 16 students.

The oscillating cost across enrollment form a cost distribution. Figures 3.2 and 3.3 show summaries of the cost distribution for the target method and the ceiling method to reach a class size of 17. The policy goal class size of 17 is used to illustrate issues seen for all class sizes. Each point represents a portion of the distribution across a range of 50 students. Three points are shown for each enrollment range, quartile 1 (25$^{th}$ percentile), median (50$^{th}$ percentile), and quartile 3 (75$^{th}$ percentile).

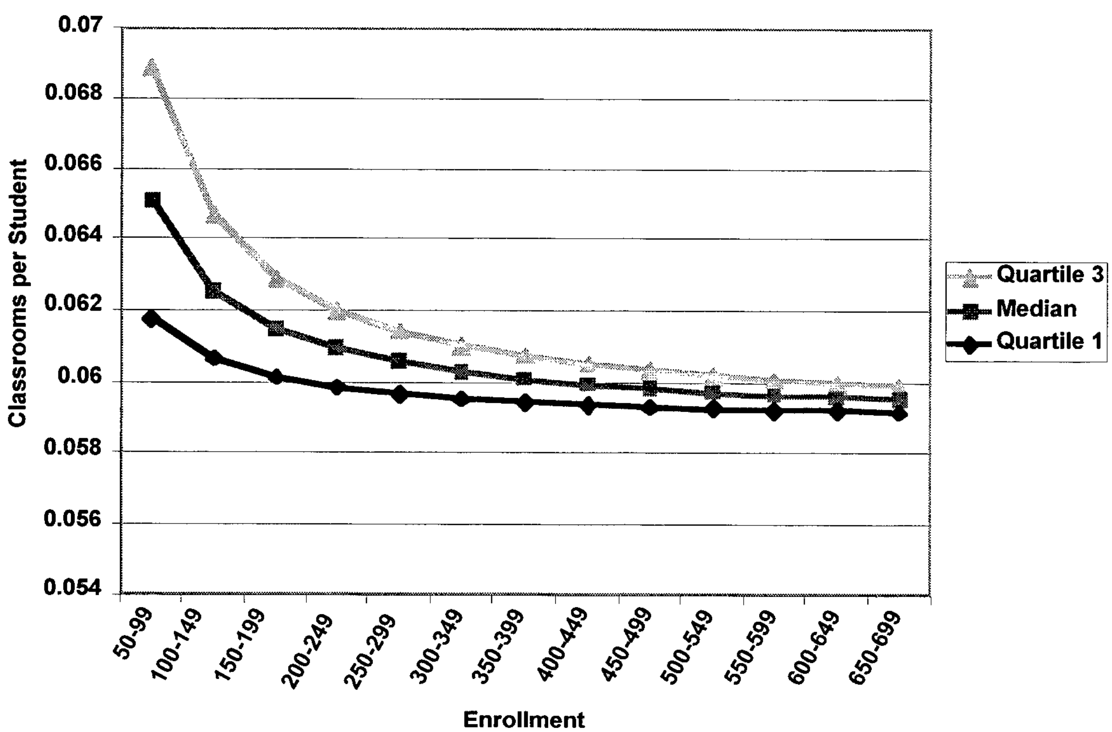
**FIGURE 3.2 DISTRIBUTION OF CLASSROOMS PER STUDENT FOR A CLASS SIZE GOAL OF 17 USING THE TARGET METHOD**




There are several key points to note about the distributions shown in Figures 3.2 and 3.3. First, the median number of classrooms for the target method is constant at under .059 across all enrollment ranges while the median for the ceiling method declines continuously. The ceiling median starts at .065 classrooms per student and asymptotically approaches the minimum number of classrooms, which is .059. This means that the median of the ceiling distribution (Figure 4.3) is continually higher than the target. In fact, ceiling quartile 1 almost exactly overlaps target quartile 3. The differences between the ceiling and target distributions quickly become small. At enrollments of between 250 and 300, the difference between the two medians is about .002 classrooms per student (using Florida prices, this difference is about $100 per student).

Finally as noted above the distribution of costs is larger for smaller enrollments. That is, the range of potential expenditures to maintain a given class size is larger for smaller enrollments. For enrollments in the range of 200 to 250, the difference in costs between the median and minimum or maximum is no more than plus or minus 4% of the median cost for each enforcement method. But for the smallest enrollment range, costs can be up to 15% higher or lower than the median cost using the ceiling method. Equally important, the ceiling distribution is not symmetrical, while the target distribution is. Using the ceiling method, the minimum and maximum costs are not equal distances from the median. If enrollment levels are evenly distributed within each enrollment range, then a school or grade implementing CSR has an equal probability of falling within any two adjacent lines. Under the target method of enforcement, the range of potential costs is an equal amount above and below the median cost of maintaining a class size. But for the ceiling method, the highest cost can be 18% of the median, while the lowest costs are 10% below the median.

**FIGURE 3.3 DISTRIBUTION OF CLASSROOMS PER STUDENT NEEDED FOR A CLASS SIZE GOAL OF 17 USING THE CEILING METHOD**




The focus of this work is on the school-level costs of CSR. Over a district with many schools, costs will average out to the median for the target method and to higher than the median using the ceiling method. But the costs at any one school or a district with just a few schools can be higher or lower than the median. In these situations the cost difference

can be very significant. If schools or small districts are funded at a fixed amount that is either the average or median cost for a given enrollment range, schools will face costs that are significantly higher or lower than the reimbursement. Of course, schools are not directly funded at this point, but this funding scheme is part of decentralization reforms discussed in the previous chapter.

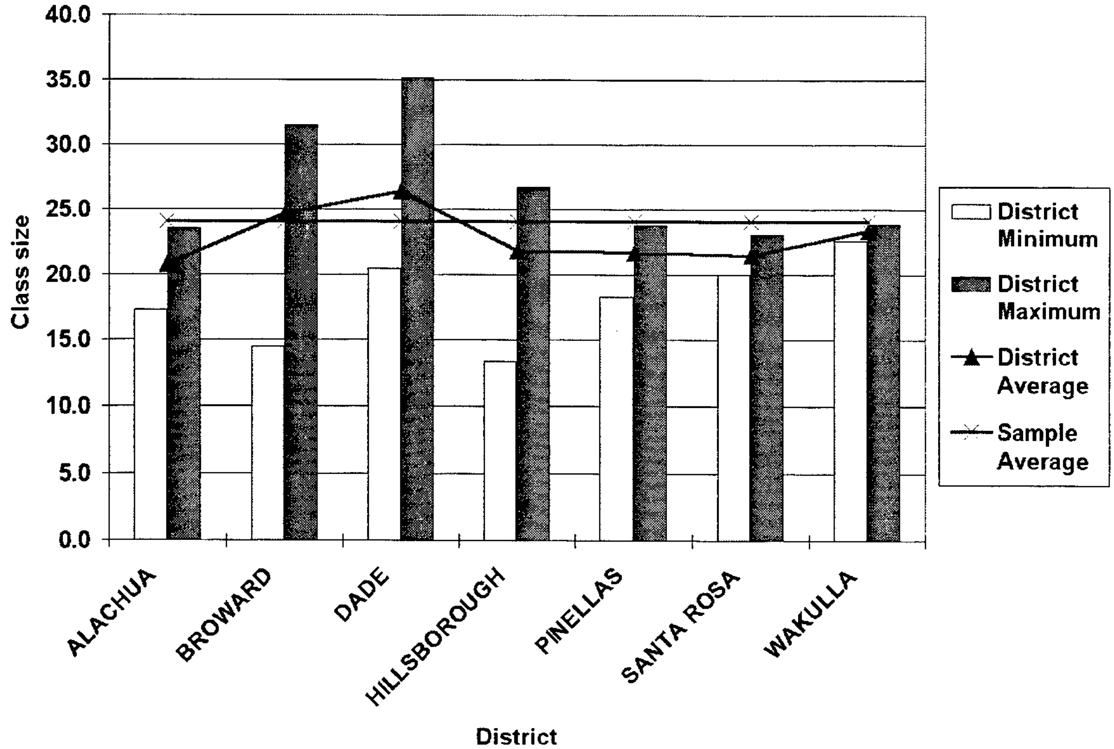
This simple hypothetical simulation has provided some key insights into how policy choices affect the costs of CSR that will be repeatedly borne out and quantified in the remaining sections of this chapter. First, smaller class sizes cost more. Second, costs using the ceiling methods are generally higher than the target method, but these differences decrease as enrollment increases. When enrollment reaches about 300, these differences are relatively small. Finally, costs at the school level oscillate as enrollment grows, with the highest costs at lower enrollments. This results in a larger distribution of costs for small enrollments. Costs can be between 12% and 16% higher or lower for schools with enrollments between 50 and 100. This distribution is not symmetrical for the ceiling method, but instead is skewed higher. This means that costs can be much higher using the ceiling method than the target method. The highest costs for the ceiling method are 15% higher than the highest costs for the target method.

## RESULTS SECTION TWO: THE FLORIDA SIMULATION

This section describes the results of a simulation of the cost of CSR across seven different school districts in Florida. The hypothetical simulation made it clear that school-level conditions are directly related to school-level costs. This finding makes it important to understand the conditions at the schools before implementing CSR. Figures 3.4 and 3.5 show class size and enrollment distributions at the school level for the schools in the sample. The school-level class size is an average across grades K–3, when mixed-grade classes are allowed. Details are provided in Appendix 4.

Each figure shows the average, minimum, and maximum levels for each district and the average across the sample. The minimum and maximum levels are shown in bar form. The averages are shown as lines. The sample average is a straight line across each chart, while the district average changes with each district.

FIGURE 3.4 DISTRIBUTION OF SCHOOL-LEVEL CLASS SIZES



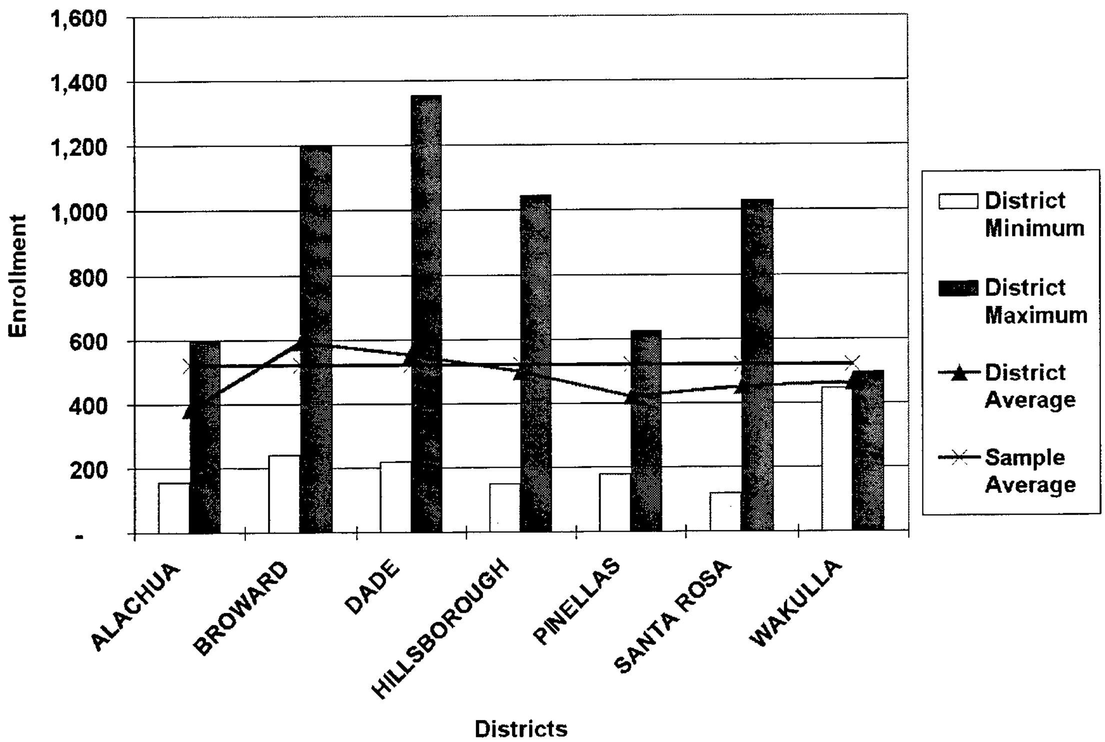

Source: FEFP & FL Class-Size Reports

Schools and districts implementing CSR have relatively large variation in conditions. The average class size across the sample is 24.1, with district averages ranging from 20.5 in Santa Rosa County to 26.4 in Dade County. The conditions at the school level vary even more. The largest differences within a district are seen in Broward County, where the largest class size is 45.0 and the smallest is 14.4.

As seen in Figure 3.5, conditions at schools also vary in terms of enrollment. The average K–3 enrollment for the sample school is 523, with the district average ranging from 386 in Alachua to just under 600 in Broward, a difference of over 50%. Within districts, conditions vary even more. The county-wide districts serve many different communities. In Santa Rosa, the range of enrollments is from 120 to over 1000, a difference of over eight times.

The conditions in schools vary considerably across and within districts, and this variation will lead to huge differences across schools and districts in terms of the cost of implementing CSR. The next portion begins a discussion of the costs of CSR, how these costs vary with school-level conditions, and how policy choices increase or decrease these costs.

**FIGURE 3.5 DISTRIBUTION OF ENROLLMENT FOR GRADES K–3**




Source: FEFP & FL Class-Size Reports

## Policy Choices and the Cost of Implementing CSR

The first choice regarding CSR is simply whether to implement it or not. A key first step in this evaluation is to compare the costs of CSR with the costs of other reforms.

The cost of CSR is compared with two school-based reforms were identified in the *Educators Guide to Schoolwide Reform* (Herman et. al., 1999)[12]. After reviewing 24 approaches to schoolwide reform, Herman identified two elementary reforms that have "strong" evidence of positive effects on student achievement[13]: "Success for All"[14] and "Direct Instruction." The costs for these reforms are the ongoing operational costs. That is, they exclude the start-up costs that occur in the first three years when some additional

12 For evaluations of the cost effectiveness of CSR see Levin, Glass & Meister (1987), Darling-Hammond (1998), and Grissmer, Flanagan, Kawata & Williamson (2000). The first two articles argue CSR is not cost effective, while Grissmer and his colleagues find that CSR is a cost-effective state-level reform.

13 Herman defined "strong" evidence as having three rigorous studies showing "educationally (or statistically) significant" effects (pp. 3).

14 Success for All uses reduced size classrooms for targeted instruction in specific subjects.

resources are required to implement the reform.[15] The per student costs of these reforms are provided in Table 3.3 below.

**TABLE 3.3 PER STUDENT COST OF ELEMENTARY SCHOOL BASED REFORMS WITH "STRONG" EVIDENCE OF EFFECTIVENESS**

| Reform | Average start-up costs (first 3 years), no additional personnel | Operational costs, (after first 3 years), no additional personnel[16] | Operational Cost with additional personnel |
|---|---|---|---|
| Direct Instruction | $216 | $125 | $225 |
| Success for All | $80 | $40 | $320-$1,292 |

Source: Herman et al. (1999)

Each reform has higher costs during the first three years of implementation as teachers are trained. After teachers are trained, costs to maintain the program are significantly lower. These operational expenses are mainly for materials. Costs increase dramatically when additional personnel are needed to implement the reform. The need for additional personnel is a factor of the number of existing staff at the school, the ability of school management to reassign personnel, and the qualifications (classified vs. certified) of the additional personnel hired. This is similar to CSR where costs are directly related to the number and qualifications of personnel (teachers and aides) hired for implementation.

"Success for All" includes smaller classes for reading, which is usually achieved by reallocating resources within schools during reading instruction. Precursors to "Success for All," which included subject- and ability-specific reduced class sizes, were recommended by Odden (1990) as a less costly alternative to class size reduction.

Figure 3.6 shows the average cost per student at the district level of reducing class size to 20 in four grades with three other reforms. The additional reform shown here is simply increasing regular expenditures by 10%.[17] The first issue to note is the extreme variation by district in the average cost of CSR, from a low of $115 per student in Alachua to a high of $733 in Dade. This variation in costs is a function of the existing class sizes as shown above in Figure 3.4 and variation in costs shown in Appendix 5. Dade has the largest average class size of 26.4 and the highest estimated cost of a classroom at just over

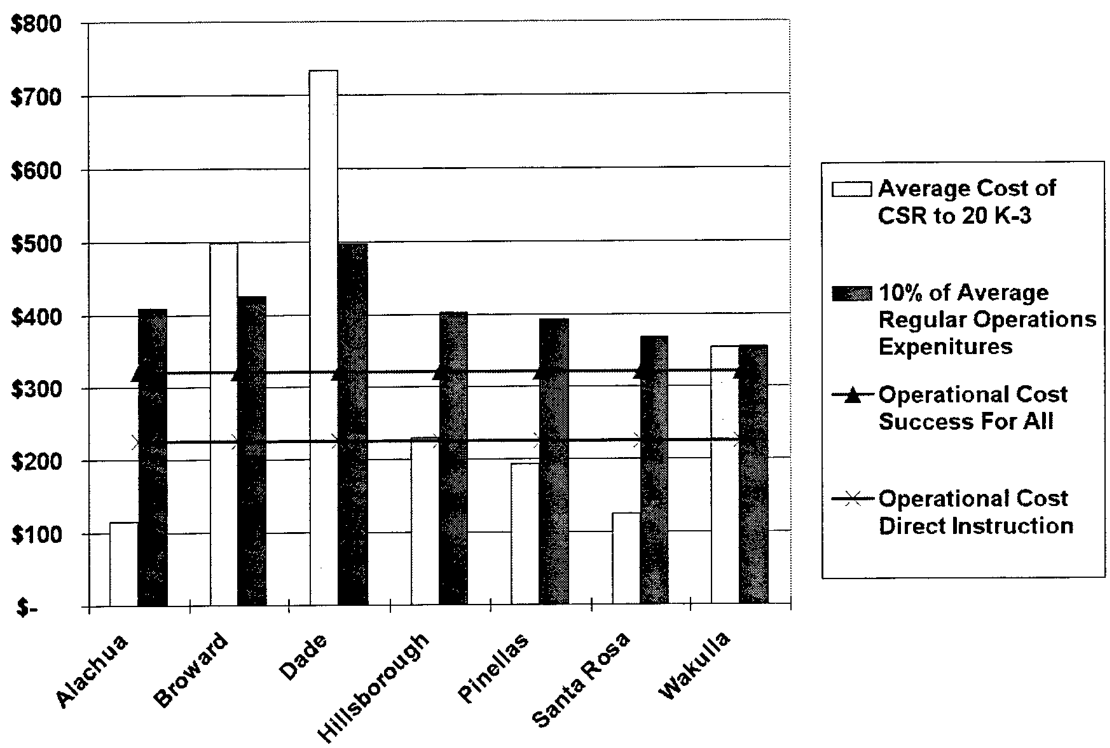
[15] The costs drop significantly to $40 per student for "Success for All" and $125 per student for "Direct Instruction" when additional personnel are not required.

[16] Costs are provided for a 500-student school with a student to teacher ratio of between 20:1 to 25:1. The year of the nominal dollar value for the estimates was not provided. The report was published in 1999.

[17] Regular expenditures do not include expenditures on exceptional, at-risk or vocational education students.

$61,000. For three of the districts, CSR is less expensive than either "Direct Instruction" or "Success for All." This is due to the existing small class sizes in many schools so that few schools actually require additional classrooms to reach the policy goal. For example, only 57% of Alachua schools require additional classrooms to meet the policy goal shown below.

**FIGURE 3.6 COMPARISON OF CSR COSTS WITH OTHER REFORMS**




Source: Herman et al (1999), Fl Indicators, FEFP & FL Class-Size Reports

Finally note that except for the two largest districts in the sample, Broward and Dade, CSR represents less than a 10% increase in operational costs for these districts.

The information presented here can be a first step in helping policymakers decide whether to implement CSR. The total cost of CSR depends on several important policy decisions that can dramatically affect the costs of CSR. The next portion addresses the relationship between policy decisions and CSR costs. As discussed in Chapter 2, state-level policymakers may find CSR attractive given the ability to mandate a reform that can be implemented quickly. Bodilly (1998) found school-based reforms to be dependent on schools' ability to freely choose a reform model. The implementation rate she found was slower than CSR's implementation rate. In her sample of 33 schools, after two years of

reform 54% were implementing or fulfilling the vision of the reforms[18]. This can be compared to the CSR experience in California, where after two years nearly 100% of grades 1–2 and nearly 70% of kindergarten and third grade classrooms had been reduced (Bohrnstedt & Stecher, 1999). The pace and lack of control over school-based reforms may make CSR more attractive to state-level policymakers than school-based reforms, despite the potentially higher cost of CSR implementation.

## Policy Decisions Regarding CSR Implementation

Assuming state-level policymakers choose to implement CSR, several important decisions remain regarding the class size goal, the number of students to be affected by the policy, and the class size measurement method. This portion makes some general observations on the cost behavior, building on what was seen in the hypothetical model. These general observations are later enumerated in the "rules of thumb." To begin the discussion, Table 3.4 shows the average cost of CSR in the sample, using leased relocatable classrooms for all of the new classes.

**TABLE 3.4 AVERAGE COST OF CSR PER STUDENT, USING LEASED RELOCATABLE CLASSROOMS**

| | Ceiling Method | | | Target Method | | |
|---|---|---|---|---|---|---|
| | 15 | 17 | 20 | 15 | 17 | 20 |
| Single Grade | $ 1,522 | $ 1,106 | $648 | $ 1,313 | $895 | $463 |
| K–3 | $ 1,363 | $950 | $488 | $ 1,310 | $891 | $440 |

Source: FEFP & FL Class-Size Reports

The class size goal is the first policy decision to be considered. Table 3.9 shows that the average cost of CSR in K–3 increases a relatively constant amount between the three class size goals considered here. The cost to reduce to 17 is approximately double the cost to reduce to 20, and the cost to reduce to 15 is approximately triple the cost to reduce to 20. The cost to reduce at the grade level as compared to the school level is approximately the same using the target method. But the ceiling method is approximately $150 more expensive at the grade level than at the school level. This indicates that costs for the ceiling method decline as the number of students sitting in reduced classrooms increases. However, the target method costs are approximately the same at both enrollment levels. This is not surprising given what was seen in the hypothetical model where the median (and average) number of classrooms per student was constant for all enrollment ranges.

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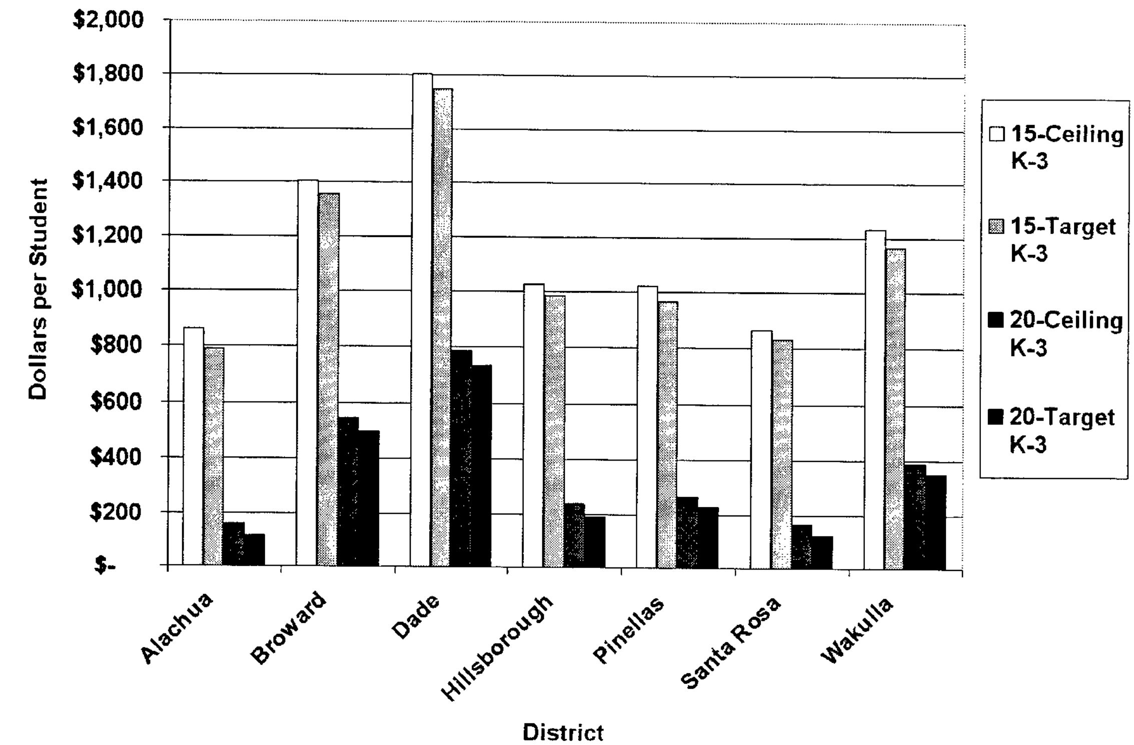
[18] It is also not clear that reform designers can quickly scale-up to support statewide reform implementation. During this two-year scale-up period evaluated by Bodilly (1998), roughly 410 schools worked to implement one of seven different school-based designs. This can be compared to the total number of elementary schools in Florida, which was 1,548 in 1997–98.

How costs vary across districts, and policy choices, must also be explored. Figure 3.7 shows the average cost to reduce class size for grades K–3 across all schools in each district, for the goal sizes of 15 and 20, using both the target and ceiling method of enforcement. The goal size of 17 was not included to make the figure easier to read. The method of enforcement does not significantly affect the cost of CSR when implemented across K–3 at once. Also, the difference in cost when the goal decreases are fairly constant is around $400 per student. A key point is the large variation in cost across the districts. The difference between the average cost in Dade County (the most expensive district) and Alachua (the least expensive district) ranges from $602 to $960. The average difference between Dade and Alachua is $790, which is comparable to the difference between the cost of reducing to 15 and 20 (which is $792).

**FIGURE 3.7 AVERAGE DISTRICT COST PER STUDENT FOR CSR FOR GRADES K–3**




Source: FEFP & FL Class-Size Reports

Finally, policymakers must decide how many students should be affected by CSR. This question involves three issues. First, are mixed-grade classes allowed? If mixed-grade classes are not allowed, then the cost differences between reducing one grade or all of K–3 are not found. Allowing mixed grades effectively increases the number of students affected by the policy. The number of students sitting in reduced classrooms interacts with the second issue, measurement method, to affect the cost of CSR. As shown in Table 3.9, costs for reducing a single grade using the ceiling method are about $150 more expensive than when using the target method. This difference is reduced to between $40 and $60 for reduction of grades K–3 with mixed-grade classes. In other words, if the number of students to sit in reduced classrooms is around 130 (the average single-grade enrollment), costs are significantly higher using the ceiling method. As enrollment grows, this different decreases, so by enrollment of 500 (the average K–3 combined enrollment), the difference is between $40 and $60.

Finally while the cost per student may decrease when CSR is targeted towards more students, the total costs increase. Table 3.10 shows the total cost to implement CSR in the entire sample in any one grade and in all four grades. The first issue that policymakers will address is simply the amount of resources available for reduction. This issue is beyond the analysis here. Table 3.5 shows the total cost (in thousands) for implementing CSR in the sample. It makes clear the obvious point that resources required for reduction in a single grade are much less than what is required for K–3 together.

The grade-level cost in the first row is an average of the cost of reducing any single grade. Comparing the first row with the second two illustrates how the cost of reduction of one grade is much less expensive using the target method and how this difference is reduced when the number of students increases. The cost of reducing class size for all four grades without mixed-grade classrooms shown in the second row is simply the single grade cost multiplied by four. The final row shows the cost of CSR in four grades allowing mixed-grade classes.

**TABLE 3.5 COMPARISON OF TOTAL COSTS FOR CSR IN ONE GRADE AND IN K–3 TOGETHER** (in thousands)

| | Ceiling Method | | | Target Method | | |
|---|---|---|---|---|---|---|
| | **15** | **17** | **20** | **15** | **17** | **20** |
| **Single Grade** | $115,527 | $87,060 | $53,019 | $101,758 | $71,428 | $38,845 |
| **K–3 without Mixed-Grade Classes** | $462,108 | $348,240 | $212,076 | $407,032 | $285,712 | $155,380 |
| **K–3 with Mixed-Grade Classes** | $399,837 | $282,185 | $151,215 | $386,327 | $267,806 | $138,519 |

Source: FEFP & FL Class-Size Reports

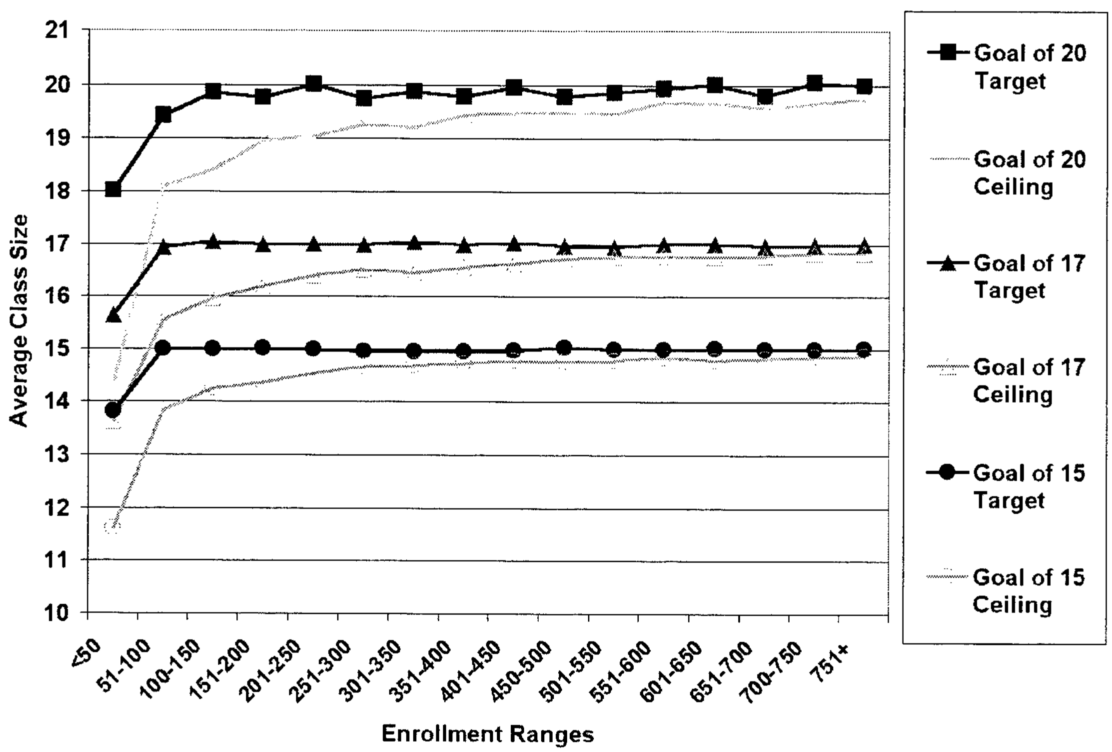
Allowing mixed-grade classes using the ceiling method reduces costs by about $40 million regardless of the class size goal. Using the target method, costs are essentially the same with or without mixed-grade classes. The educational costs and benefits of mixed-grade classrooms are not addressed here, only the relative dollar costs.

Another issue that is not addressed here is overall school size. The literature fairly consistently finds smaller elementary schools are associated with better student performance (Fowler, 1991).

## "Efficiency" of Different Measurement Methods

Costs for the ceiling method are between 4% and 18% higher than for the target method. The largest differences between the ceiling and target method are at lower enrollments. As enrollments get larger, the difference in cost between the two methods gets smaller. The difference in costs at the lower enrollments is a product of differences in efficiency in implementation. Efficiency, in this case, is the difference between the policy goal and actual class size. In other words, efficiency measures the ability of policies to achieve the class size policy goal. Figure 3.8 shows the average class size after reduction for different enrollment ranges.

**FIGURE 3.8 AVERAGE CLASS SIZE FOR DIFFERENT ENROLLMENT RANGES**




Source: FEFP & FL Class-Size Reports

The higher costs for the ceiling method relative to the target method are directly related to the smaller class sizes after implementation. For the ceiling method, average class sizes are significantly smaller than the policy goal for enrollment ranges of 0 to 50 and remain below the policy goal for all enrollment ranges. For example, with the policy goal of 20, the average class size for enrollment between 50 and 100 is 19.4 for the target method and 18.1 for the ceiling method. This difference between actual and policy goal class sizes at low enrollments drives costs higher in small schools. At enrollment levels above 150, class sizes using the target method are essentially stable within .2 of the policy goal for all

class size goals. This indicates that at enrollments higher than 150, the cost of class size reduction is at or close to minimum for the target method. At the same time, class sizes for the ceiling method decline continuously and approach the policy goal throughout the enrollment range of 50 to 750. Just as was seen in the hypothetical model, costs for the ceiling methods are expected to slowly, but continuously, decline.

The target method is clearly more efficient at meeting the policy goal than the ceiling method. At lower enrollments, both methods produce average class sizes that are different from the policy goal. The target method class sizes are closer to the policy goal than the ceiling methods, and target method class sizes more quickly approach the policy goal as enrollment increases.

## Policy Decisions: What Is Included in a Classroom?

### Aides

Personnel costs for teachers and aides make up the largest component of new classroom costs. Districts can choose whether to include aides as members of new classrooms and have some control over the salary paid to the teachers who fill new classrooms. As discussed in the beginning of this chapter, the baseline cost of a new classroom includes:

- a teacher at the median salary and benefits for new teachers to the district in 1997–98,
- aides' salaries and benefits to maintain the aides to regular teachers ratio seen in a district previously, and
- the cost of a leased relocatable classroom including furniture, operations and maintenance.

CSR policy may include changing the number of classroom aides as class sizes are reduced. As discussed in Chapter 2, Project STAR found no difference in student performance between regular-sized (22–25) classrooms with aides and without aides (Word et. al., 1990). It is possible that reduced classes will not require aides. The estimated costs of aides per classroom are shown in Table 3.11. There is large variation among districts on expenditures for teacher aides. The largest costs are in Dade County, which expends $11,000 per classroom. These high costs are driven by both high numbers of aides and high salaries. This is relative to the low intensity of use and salaries seen in Alachua, which spent about $1,800 per classroom on aides.

If aides were dropped from all reduced grades, there would be considerable cost savings. In some districts, these savings are comparable to the cost of reducing classrooms. Table 3.6 shows the estimated cost of CSR per student (without aides) and the total expenditures per student on aides, as well as the total cost of reducing classrooms (without aides). In Pinellas and Santa Rosa, the expenditures on aides is more than the cost of CSR. In these districts, dropping classroom aides could free enough resources to implement CSR. In the other districts, the savings from dropping aides ranges from a low of 31% (of the cost of CSR in Broward County) to a high of 93% (of the cost in

Hillsborough). Dropping aides in all classrooms would cover about 65% of the total cost of CSR to 20 in this sample of districts.

**TABLE 3.6 COMPARISON OF ESTIMATED EXPENDITURES ON CLASSROOM AIDES AND COST OF CSR WITHOUT AIDES**

| | Per Student Cost of Reducing to 20 Using the Target Method | Total Cost of CSR To 20 Using the Target Method in K–3 (in thousands) | Estimated Per Student Expenditures on Aides Without CSR | Estimated Total District Expenditures on K–3 Aides (in thousands) |
|---|---|---|---|---|
| **Alachua** | $111 | $1,020 | $87 | $765 |
| **Broward** | $464 | $33,420 | $150 | $10,472 |
| **Dade** | $600 | $66,319 | $421 | $45,781 |
| **Hillsborough** | $207 | $11,200 | $210 | $10,376 |
| **Pinellas** | $172 | $6,011 | $232 | $7,798 |
| **Santa Rosa** | $111 | $880 | $252 | $1,458 |
| **Wakulla** | $313 | $436 | $241 | $339 |
| **Total** | | $119,286 | | $76,989 |

Source: FEFP & FL Class-Size Reports

Of course, replacing aides with classrooms to reduce class size can be difficult and have some unintended consequences. Many of the aides are paid by Title 1 funds from the federal government. The 1994 reauthorization of Title 1 made schoolwide programs much easier for schools with a large proportion of low-income students (Palmaffy, 1999). In those schools that qualify for schoolwide programs, districts may be able to replace Title 1 aides with teachers for reduced size classrooms. In schools that do not qualify for a schoolwide Title 1 program, this transition may be difficult. School officials may also resist loss of aides in grades K–3 if the aides' activities are more valuable than reduced class sizes. For example, in those classrooms that are already below the class size goal, removal of aides would represent a net reduction in classroom resources. The loss of the aides may be small since districts with small existing class sizes are also those that expend little on aides but would surely be noticed as the aides' duties are reassigned. Finally, the aides themselves could resist job loss and make it politically difficult to completely replace them with classroom teachers.

### Teachers

Another classroom component districts have some influence over is the teacher who occupies a classroom. Teacher salaries are generally a function of teacher experience and education. School districts can implement policies that attempt to fill classrooms with teachers who are either more experienced or more educated (and higher priced). If

districts are concerned about costs, they can put in policies that select teachers who are less experienced or educated, and are thus less expensive. However, district choices are constrained by state policies that set minimum education levels for teachers and by the teachers available in the labor market.

The distribution of salaries for new teachers in the sample districts was shown earlier in Table 3.3. It gives some indication of the availability of teachers of varying qualifications and costs. There is little or no difference between the 25th percentile and the median salaries. This indicates that districts are generally hiring a substantial number of teachers near the bottom end of the salary scale. Given the fact that districts are already hiring many teachers near the bottom of the salary scale, they may have little flexibility in finding more lower salary teacher than they are currently hiring. Salaries at the 75th percentile are noticeably higher. For example, salaries in Broward at the 75th percentile are 129% of the 25th percentile. For the remaining districts, the difference between lower and higher salary new teachers is between 8% and 21%. Taken together this suggests that districts may have the ability to use higher salary teachers for reduced classrooms, but less ability to find lower salary teachers for new classrooms.

During implementation of CSR, it may be difficult for school districts to raise entrance qualifications because it will reduce the pool of applicants at the same time that CSR increases the demand for new teachers. Ballou and Podgursky (1995) argue that raising entrance qualifications of teachers will reduce the pool of potential teachers. Findings on changes in teacher qualifications discussed in Chapter 5 indicate that the teacher labor market became very tight during CSR implementation in California. The end result is that many of the teachers hired during this period had lower qualifications (i.e., uncertified and minimum education levels).

School districts in Florida may not have much flexibility in the salary levels they pay during CSR implementation. Most new teachers in the sample are hired near the bottom of the salary schedule, and the teacher labor pool in Florida may not have enough higher qualified (and more expensive) teachers to fill new reduced classrooms.

## Capital Costs

Capital costs are the costs for additional classroom space. Decisionmakers at schools have several options for finding this space, including building new classrooms, adding relocatable classrooms, displacing other school functions in favor of classrooms, or developing some mixture of these options. In this portion, the relative short-term capital costs are evaluated for several different policy options:

- leased relocatable classrooms for all new classes,
- use of any existing classrooms not currently assigned to teachers for new classes, and
- use of non-instructional space for new classes.

The first issue is how many classrooms need to be added to reach the policy goals. Table 3.7 shows the median number of added classrooms per school for the various CSR policies. For example, to reach a class size of 15 at the school level, the median number of added classrooms is 12 using the target method. The estimated cost of a leased relocatable classroom is $6,000 per year including furniture. Added to this are operations and maintenance costs that average $4,930 in the sample. Using relocatable classrooms increases the cost of CSR above personnel costs by between 25 and 28%.

**TABLE 3.7 MEDIAN NUMBER OF ADDITIONAL CLASSROOMS PER SCHOOL NEEDED TO REACH CSR GOALS**

| | Ceiling method | | | Target method | | |
|---|---|---|---|---|---|---|
| | 15 | 17 | 20 | 15 | 17 | 20 |
| Grade | 4 | 3 | 2 | 3 | 2 | 1 |
| K–3 | 13 | 9 | 5 | 12 | 8 | 4 |

Source: FEFP & FL Class-Size Reports

Very few schools in this sample appear to have existing classroom space that is not being used as classrooms. Of the 535 schools in the sample, a large majority, 447, have relocatable classrooms with an average of six relocatable classrooms per campus. About 10% of all classrooms in the sample are relocatable classrooms. The presence of relocatable classrooms implies that all available space is being used for classrooms. Of the remaining schools that do not have relocatable classrooms, 33 have "extra" classroom space. The median number of extra classrooms is four. Use of this extra space at these schools would reduce the number of classrooms needed by four per school for reduction of grades K–3, and two classrooms per school for reduction of any single grade. Use of this extra space produces relatively small cost savings. For example, for the entire sample, the cost of leasing relocatable classrooms to reduce class size to 20 for grades K–3 is just over $16 million. The savings from using extra space are estimated to be under $700,000 or about 4%. For the different class size goals and enforcement mechanisms, the savings from using extra space is between 2 and 6%.

**Non-Classroom Space Available at the School Level**

If necessary, rooms in schools that are currently used for other purposes can be converted to classrooms. These rooms include specialist classrooms (i.e., music, art and computer laboratories), libraries, gymnasiums, and non-instructional space such as lounges and auditoriums. Use of these spaces for classrooms eliminates their availability for their intended use. Table 3.8 shows the number of schools that have different types of space and the median number of classrooms that could be created. For example, of the 535 schools in the sample, 400 have specialist classrooms and 488 have libraries that are large enough to be converted into classrooms. Each has approximately three specialist classrooms, and conversions of the libraries to classrooms would create approximately two classrooms per school.

**TABLE 3.8 CLASSROOMS CREATED FROM CONVERSION FROM OTHER USES TO CLASSROOMS**

| | Specialist Classrooms | Library | Gymnasiums | Non-Instructional Space |
|---|---|---|---|---|
| **Median Number of Available Classrooms** | 3 | 2 | 1 | 1 |
| **Number of Schools with Available Space** | 400 | 488 | 202 | 339 |

Source: FEFP & FL Class-Size Reports

Use of this space for new classrooms can produce large cost savings. The amount of money saved is related to the number of rooms needed to reach the classroom goal and the supply of rooms from conversion. The cost savings from using each of the different groups of space for new classrooms are detailed in Appendix 6. The largest source of potential classrooms is libraries and specialist classrooms. Conversion of either type of space into classrooms will reduce the costs for classroom space by 14-46% if implementing in grades K–3 and 46–83% when reducing in one grade. Of course conversion of this space replaces the current use with classroom use. The cost savings must be balanced with the cost of lost libraries, music classes, PE classes, and auditoriums. Conversion of all these rooms to classrooms will meet only about two-thirds of the classroom needs for reduction of K–3 to 20.

The key question is if the dollars saved from using the existing space, or conversion, is worth the cost of displacing the current function with a reduced classroom. This is a difficult decision to make without more information on what the space is currently being used for. The best information on current space usage is at the school level. Those at the school level are well aware of the cost of lost activities from space converted to classrooms. The lost space could be a room converted from storage use to classroom use, or playground space lost when a portable classroom is added. Those at the school level do not often pay the cost of purchasing or building new classroom space. This makes those at the school very aware of the costs of losing existing space for new classrooms but not aware of the dollar cost of leasing new classrooms.

The converted space may be used to temporarily reduce the demand for new classrooms. This may be useful during a temporary shortage of relocatable classroom space or while new permanent buildings are being constructed.

## SECTION THREE: RELATIONSHIP BETWEEN EXISTING CONDITIONS AT SCHOOLS AND CSR COSTS

The previous section contained observations about the cost of CSR in the sample of Florida schools. In this final section, the "rules of thumb" about the cost of CSR are created for use by policymakers outside of Florida. The rules of thumb show the cost ramifications of policy decisions, and in Chapter 4 will be shown to be an effective method for estimating reimbursements for CSR implementation.

The rules of thumb are translations of the results from multivariant regressions into plain language. The regression methodology is described first, followed by a discussion of the regression results culminating with the rules of thumb.

### Regression Methodology

To make the results more generalizable, the regressions were run using classrooms per student as the cost measure. The regressions were run on a data set that contained the cost estimates of CSR in each individual grade and K–3. Each school provided five observations, one per grade and the sum of all four grades together, for a total of 2,634 observations.

The regression was only run for schools and grades that did not already meet the policy goal. Thus these predictions only hold for schools and grades that do not meet the policy goals before implementation. Using only grades and schools that require additional classrooms makes these findings more applicable to other schools and districts. If schools and grades that did not require additional classrooms were used, then these findings would be more dependent on the distribution of class sizes in the sample and less applicable to other districts with different class size distributions.

Many different model specifications were examined. The independent variables used in the models reflect the intuition gathered from the hypothetical model; i.e., the relationship between enrollment and cost is non-linear, the relationship between class size and cost is linear, and costs are higher at small enrollments. Given these general lessons, the model that was used maximizes the variation explained for all the six different options (ceiling and target for 15, 17 and 20) and maintains simplicity. The model explained at least 80% of the cost variation for each of the different policy options. Table 3.9 lists the independent variables used in the model. The regression coefficients are found in Appendix 7.

**TABLE 3.9 COEFFICIENTS FOR MODEL DESCRIBING THE COST OF CSR**

Existing class size

Enrollment

Enrollment squared

Enrollment less than 49

Enrollment between 50 & 99

Enrollment over 250

## Regression Results

Table 3.10 provides predicted cost estimates using the regression coefficients. These can provide a baseline for comparisons. These cost estimates are significantly higher than the ones shown in Table 3.4 because they only include schools that need to add classrooms to reach the policy goal. The appropriate comparison is with the averages shown in Tables 7 and 8 of Appendix 5, which are higher than these predictions. The largest differences in the estimated costs and the actual costs seen in the sample are with the class size goal of 20. The predicted cost for the target method at the grade level is 33% lower than the average costs in the Florida simulation. This difference is within the margin of error of the estimation model. The difference is caused by the fact that the predicted costs are for grades of average size, controlling for costs at lower enrollments, while the averages are increased by several extremely high costs at relatively low enrollments. A secondary reason is that the average costs are weighted by grade while the costs used in the regression are weighted by classroom. If average costs are weighted by classroom, the difference between the average and the regression estimates is slightly reduced.

**TABLE 3.10 ESTIMATED COST OF CSR BASED ON THE REGRESSION MODEL FROM AN EXISTING CLASS SIZE OF 24**

| | | 20 | | 17 | | 15 | |
|---|---|---|---|---|---|---|---|
| **Measurement Mechanism** | | **Ceiling** | **Target** | **Ceiling** | **Target** | **Ceiling** | **Target** |
| **Enrollment** | **130** | $668 | $501 | $1,098 | $901 | $1,497 | $1,318 |
| | **500** | $488 | $463 | $955 | $918 | $1,375 | $1,333 |

Source: FEFP & FL Class-Size Reports

The regression results provide a key insight on the quantification of the higher costs associated with the lower enrollment levels. Remember that the costs are the average for schools that do not already meet the policy goal. Thus these are not the average costs for all schools, just for schools that need to add classrooms to meet the policy goals. The coefficients for the dummy variables "Enrollment less than 49" and "Enrollment between

50 and 99" are all positive. Table 3.11 uses the results of the regression to estimate the increase in costs when enrollment is fewer than 99 and fewer than 49. Clearly theses results show costs increase significantly as enrollment moves below 100 and below 50. The increases in costs for enrollment under 50 are very large, up to double the cost per student for enrollments of 130 at the same class size. The increases in costs for enrollments between 50 and 100 are much smaller.

**TABLE 3.11 ESTIMATED INCREASE IN COSTS FOR LOW ENROLLMENTS**

| | 20 | | 17 | | 15 | |
|---|---|---|---|---|---|---|
| **Enforcement Mechanism** | **Ceiling** | **Target** | **Ceiling** | **Target** | **Ceiling** | **Target** |
| **Average increase in cost changing enrollment from 130 to under 100** | 15% | *16% | *10% | *4% | *7% | -1% |
| **Increased cost moving enrollment from 130 to 45** | *118% | *154% | *39% | *42% | *41% | *15% |

* Indicates significant coefficient at the .05 level
Source: FEFP & FL Class-Size Reports

Many schools with low enrollments had small class sizes. The average class size for enrollment under 50 is 20.0, 4.3 students per classroom smaller than the entire sample. In this analysis, those schools with small enrollment and smaller class size are dropped. For those that did need to add classrooms, the costs are very high. These costs are higher because the base number of students this cost is spread over is small. For example, compare two schools with a class size of 22.5, one with 45 students and two classrooms and another with 90 students and four classrooms. Each needs to add an additional classroom to reach a class size goal of 20. The cost per student for the small school would be $1,191 compared to the larger school where the costs are roughly half at $595.

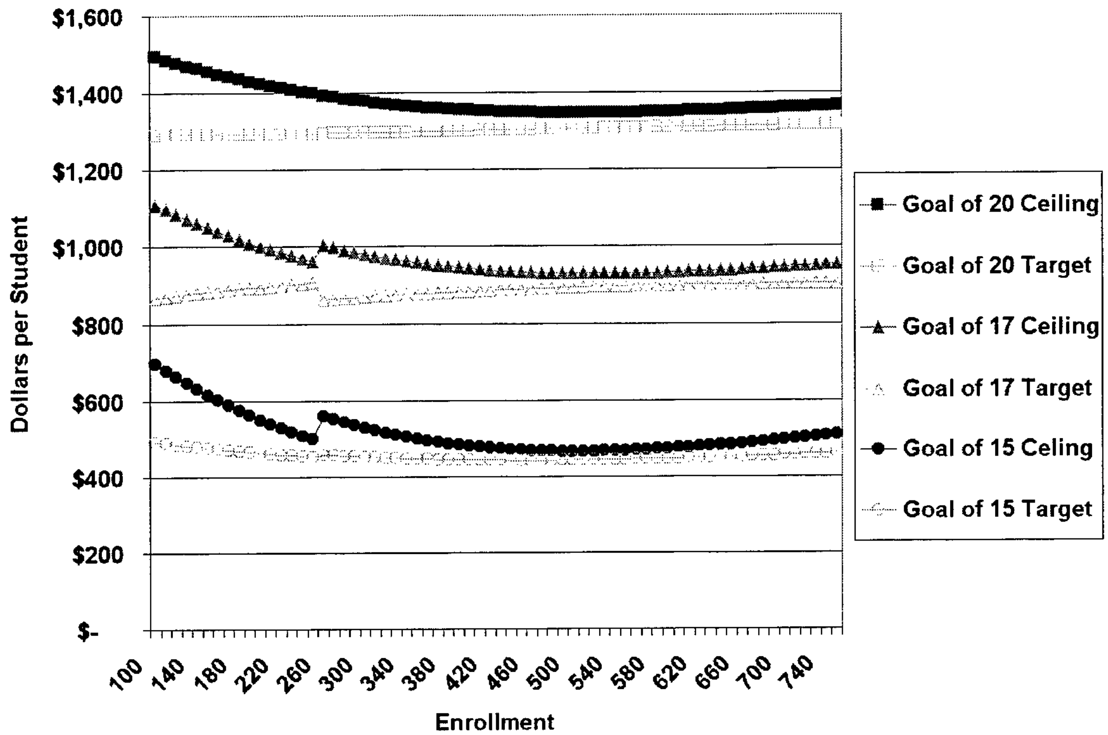
The next issue is the general relationship between cost and class size. All of the coefficients on class size are significant and relatively similar from .00125 to .00166.[19] When converted to dollars, these coefficients indicate that for each change of existing class size by one student, the cost of CSR changes by $70 for reduction to 20, $84 for reduction to 17, and $89 for reduction to 15, for an average of $80 per student.

The hypothetical model indicated that, above small enrollments, the relationship between cost and enrollment is relatively flat for the target method and ceiling costs approach those of the target method. The relationship for smaller enrollments was described earlier. Figure 3.9 shows the estimated cost of CSR for enrollment ranging from 100 to 700 holding class size constant at 24.

[19] They are not statistically the same at the .05 level.

**FIGURE 3.9 ESTIMATED RELATIONSHIP BETWEEN ENROLLMENT AND COST OF CSR, HOLDING CLASS SIZE CONSTANT**

Source: FEFP & FL Class-Size Reports




The data presented in Figure 3.9 confirm some relationships among enrollment, measurement method, and cost seen in the hypothetical model. The costs for the target method are basically unchanged as enrollment changes. Several models were used that introduced non-linear enrollment terms, which did not affect the final relationships.

The differences between the ceiling and target methods are fairly similar for all class size targets. At enrollment of 130, the difference ranges from $165 to $196. All of these differences hit a minimum level at enrollment around 500. The differences decline along a non-linear path. It declines quickly at lower enrollments and then less rapidly as enrollment increases. The minimum difference is between $23 and $40 with an average of $33. The increasing differences above 600 are small and are most likely a product of the enrollment-squared term and not accurate representations of the behavior of costs. The breaks in the lines at enrollment of 250 are a product of the fixed-effects portion of the model that was employed to capture differences between medium enrollments of 100 to 250 and large enrollments above 250.

## Rules of Thumb

The basic relationships between the cost of CSR and school-level conditions have been discussed above. Costs increase by a relatively constant amount as the class size goal moves from 20 to 17 and 15. Costs change by about $80 for each increase or decrease of one from the existing class size of 24. Costs are higher for smaller enrollments. Costs are higher when using the ceiling method. The difference between the ceiling and target methods declines as enrollment increases.

The only remaining issue needed to complete the rules of thumb is to approximate the changes in costs for the ceiling method as enrollment decreases. The difference between the target and ceiling methods declines at a non-linear rate. The difference declines quickly at lower enrollments and then less rapidly at enrollments above 300. A simple linear approximation of this difference is $240 at enrollment of 100. The "ceiling penalty" declines at a rate of $.75 for each student when enrollment increases over 100, until the difference hits $40 at an enrollment of 367. From this point on, the difference remains at $40. This approximation overestimates the penalty at low enrollments (100 to 275) and underestimates the penalty at higher enrollments (367 to 500).

The rules of thumb essentially provide an average cost per student for a given enrollment range and existing class size. Note that these rules are for estimating the cost per student in schools that need to add classrooms to meet policy goals. They are provided in dollar terms but can be converted to rooms per student by dividing by $53,000 (the cost of a staffed, relocatable classroom). Their range of applicability is for class sizes between 20 and 32,[20] and enrollments between 50 and 750.[21]

1. **Base Cost:** Costs for the target method increase in $435 increments. To reduce from a class size of 24 to a class size of 20 costs approximately $435 per student; to reduce to 17 costs double this or $870; and to reach 15 costs $1,305 (3 x $435) per student.

2. **Class Size Cost:** For existing class size, each change of one student above or below 24 add (for an additional student) or subtract (for each reduction of one student) $80 from the base amounts listed above.

3. **Ceiling Penalty:** Costs are higher for the ceiling method and are related to enrollment. The additional cost can be estimated by adding $240 to the sum of the base and class size costs described above for enrollment of 100. This penalty is reduced by $.75 for each additional student above 100 up to enrollment of 367, where the difference of $40 per student should be maintained for all higher enrollments.

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[20] Estimates for existing class sizes above 32 overestimated the costs seen for the Florida sample by between $158 and $185 using the ceiling method, and about $85 for the target method for goals of 15 and 17, and $166 for a goal of 20.

[21] Estimates were made for the Florida sample for enrollments up to 1350 and were no less accurate than estimates for lower enrollment levels. But the sample size for these larger enrollments was relatively small and thus estimates for this enrollment range are harder to support. Costs vary dramatically at enrollments under 50, making estimates very inaccurate.

4. **Low-Enrollment Penalty:** Costs are significantly higher for enrollments under 100 for all methods. These differences are summarized in Table 3.12 below. The base cost calculated using the first three steps above multiplies by these additional cost factors to reach the final cost estimate.

**TABLE 3.12 RULES OF THUMB MULTIPLICATION FACTORS FOR COSTS WHEN ENROLLMENT MOVES UNDER 100**

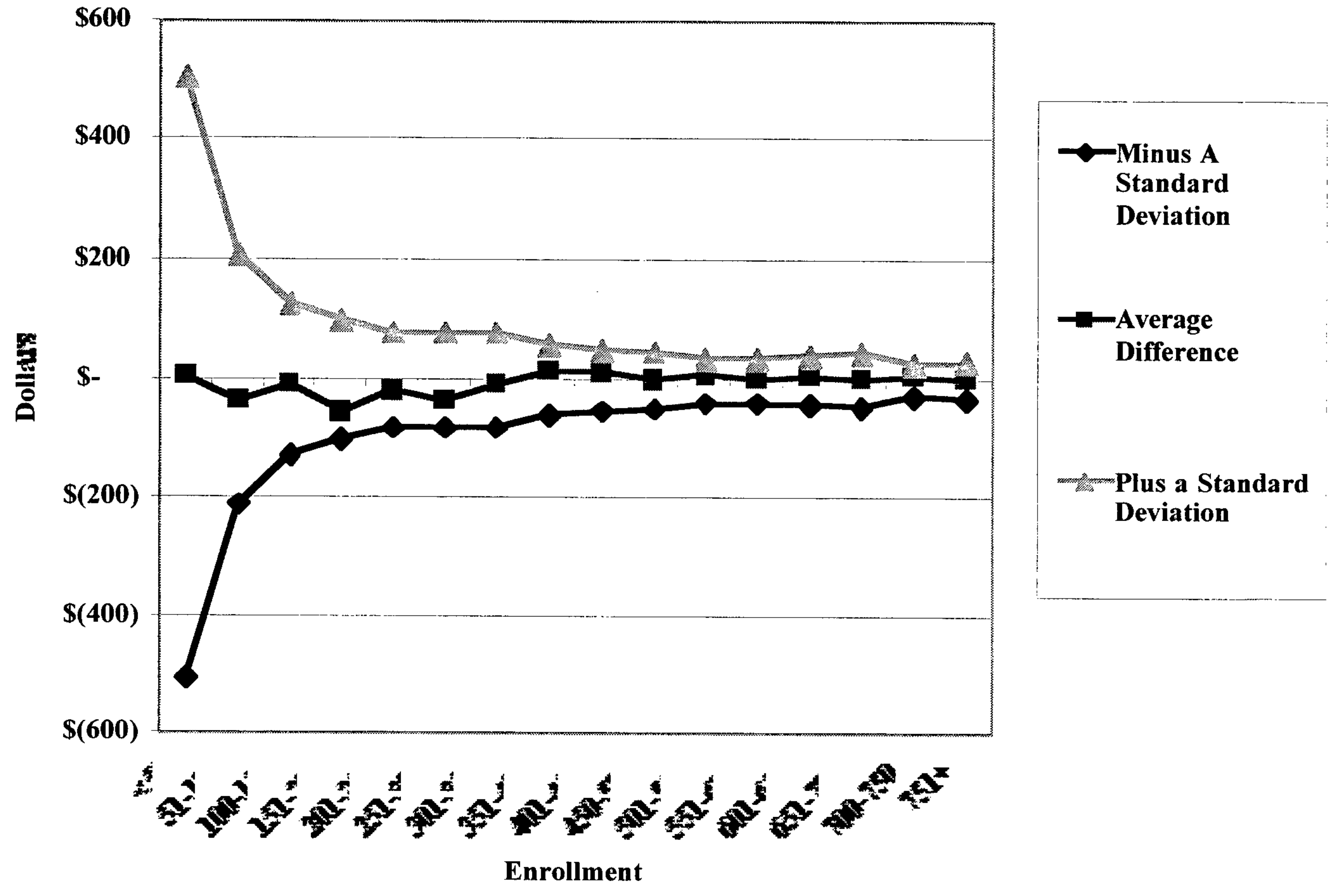
| Class Size Goal | 20 | | 17 | | 15 | |
|---|---|---|---|---|---|---|
| **Enforcement Mechanism** | **Ceiling** | **Target** | **Ceiling** | **Target** | **Ceiling** | **Target** |
| **Multiplication factor if enrollment is between 50 and 100** | 10% | 10% | 5% | 5% | 0% | 0% |

**Fit of the Rules of Thumb**

To learn more about the accuracy and precision of the rule of thumb estimates, they were compared to the costs from the original simulation. There is large variance in costs especially at low enrollments. For example the standard deviation in cost estimates for enrollment between 50 and 100 ranges from $185 to $222. This makes precise cost estimates at lower enrollments more difficult since these predictions are basically of average costs for an enrollment range. When costs vary extremely, predictions using the rules of thumb will be less accurate.

One way to examine the relative precision of the rules of thumb is to segment the sample into different enrollment ranges in increments of 50 students (i.e., 0–50, 51–100, 101–150, etc.) and examine the average and standard deviation of the difference between the rule of thumb estimates and simulated cost. The average difference between the estimated cost using the rules of thumb and the simulated cost is largest for the ceiling method. Figure 3.10 shows the average difference and standard deviation of this difference between the rules of thumb cost estimate and the simulated cost estimate for reduction of K–3 to 20 using the ceiling method.

FIGURE 3.10 AVERAGE AND PLUS OR MINUS A STANDARD DEVIATION OF DIFFERENCE BETWEEN RULES OF THUMB COST ESTIMATES AND ACTUAL COSTS, REDUCTION TO 20 USING CEILING METHOD




The average difference ranges from negative $54 to $16, with most differences within plus or minus $20. The standard deviation of the difference is very large at lower enrollments, and quickly falls to under $100 for enrollments over 150. The standard deviations are indicators of the precision of the rules of thumb. The distribution of difference between the simulated and rule of thumb estimated costs are generally normally distributed.[22] This indicates that about 70% of the actual costs are within plus or minus one standard deviation of the estimated costs using the rules of thumb.

22 The Shapiro-Wilk test indicates that the difference between the estimated cost using the rules of thumb and the simulated cost are normally distributed for all policy options and for enrollment groupings under 300 at the .1 level except class size goals of 17 and 20 using the target method. For enrollment groupings over 300, the sample sizes are smaller and the majority of the differences are not normally distributed.

The standard deviations for enrollment under 50 are approximately $400, moving to $200 for enrollment between 50 and 100, and approximately $150 for enrollments between 100 and 200. For enrollments over 200, the standard deviation ranges from $25 to $91 with an average of about $75.

In other words, at small enrollments, the rules of thumb are not very accurate, but as enrollment increases the accuracy of the rules of thumb estimates increase. At enrollments over 200, the rules of thumb are within $75 of actual cost the majority of the time.

## CONCLUSIONS

The aim of this chapter was to provide state and federal policymakers with information about the cost ramifications of CSR implementation policy decisions. This information should help them as they contemplate important decisions regarding whether to implement CSR, the CSR class size goal, the number of students to sit in reduced classrooms, the class size measurement mechanism, and reimbursement strategies. The chapter proceeded through three sections to get a complete understanding of the cost of CSR. The first section used a hypothetical model to understand the basic behavior of the cost function. The second used a simulation of CSR in seven Florida school districts to understand how CSR would affect real schools and districts. The final section used regression analysis to quantify the cost of CSR in "rules of thumb" that generalize the cost of CSR beyond the Florida sample.

The hypothetical model outlined key features of the CSR cost function. These features include:

- larger cost variation at low enrollments,
- much higher costs for ceiling method at low enrollments, with decreasing, but constantly higher, costs as enrollments increase to 750, and
- higher cost as class size goals decrease.

The next section used a cost simulation in seven Florida school districts to make the cost of CSR more concrete. In this sample, the average cost of CSR was generally higher than the operational cost of two school-based reforms that have been identified as having "strong" evidence of effectiveness. In all but the largest districts, CSR was less than or equal to a 10% increase in operational expenditures.

The simulation showed that higher costs at lower enrollments and using the ceiling method are caused by differences between the actual class sizes and the policy goals. For example, at enrollments between 50 and 100, the average class size when reducing to 20 is 18.1 using the ceiling method and 19.4 using the target method. The ceiling method is less efficient than the target method in that class sizes with the ceiling method are farther from the goal than class sizes using the target method.

The next issue addressed was the flexibility that Florida policymakers may have in changing classroom components. The new teacher salary distribution showed that most new teachers were being hired at the low end of the salary schedule. This implied that districts would have little flexibility in lowering teacher salary costs for CSR. The data are not adequate to inform the question of whether districts could find higher paid teachers to implement CSR. While districts did hire some more experienced and better educated teachers (as well as higher paid), it is not clear if the supply of the better qualified teachers is adequate to fill extra classrooms created by CSR. Reallocation of funds spent on aides to CSR could provide about 65% of the total cost of reduction to 20, covering the entire cost in districts that already had smaller classes.

In the sample there was little indication that schools had available space for extra classrooms. Most of the schools in these districts already had relocatable classrooms, indicating there was little existing "extra" classroom space. In the 88 schools that did not have relocatables, only 33 had more classrooms than teachers. Use of these classrooms would reduce the classroom costs by about 4% (for reduction to 20 using the target method). Most schools did have specialist classrooms, libraries, gymnasiums and other space that could be converted to classroom space. Use of this space would fill about two-thirds of the classroom demands of CSR to 20.

Through a multivariant regression, the simulation results were used to create four simple rules of thumb that related the cost of CSR to existing conditions and policy choices. They highlight how much school-level conditions interact with policy decisions to vary costs. These rules are:

1. **Base Cost:** There is a base cost of about $435 per student for reduction from 24 to 20 using the target method. This base cost doubles for reduction to 17 and triples for reduction to 15.

2. **Class Size Cost:** Each increase or decrease of existing class size above or below 24 adds or subtracts $80 to the base cost. This class size cost is about 20% of the base cost for reduction to 20.

3. **Ceiling Penalty:** Using the ceiling method adds about $240 to the base cost for enrollment of 100. The ceiling penalty declines in a (roughly) linear fashion as enrollment increases to about 370. Above 370 the penalty is a constant $40.

4. **Low-Enrollment Penalty:** Cost are higher for schools with low enrollments, 10% above the sum of base cost, class size cost, and ceiling penalty for reduction to 20 and 5% higher for reduction to 17.

The rules of thumb were calculated using $53,000 as the cost of a new classroom. These rules of thumb can easily be applied to areas with different classroom costs. First, divide the amount in the rule of thumb by $53,000, and then multiply by the new classroom

cost. For example, using the estimated classroom cost in Santa Rosa of $48,000 reduces the Base Cost from $435 to $394, and the Class Size Cost from $80 to $72. [23]

Policy choices clearly matter for the costs of implementing CSR. The rules of thumb are expected to meet education policymakers' need for information on the cost implications of CSR implementation decisions. These choices are not just whether or not to implement CSR, but for which groups of students, to what size, and which enforcement mechanism to use.

Several points are clear. Obviously, lower target class sizes increase the costs. Using the target method from a class size of 24 costs double when the class size goal increases to 17 from 20 and triple when going to 15. Second, the cost of reduction is higher, on average, in smaller schools regardless of the measurement method. Finally, using the ceiling method of enforcement significantly increases costs because actual class sizes are much smaller than the policy goal. In other words, the ceiling method is not an efficient way of enforcing class size targets.

The issue of higher costs in smaller schools may be a particular problem for rural districts. In the Florida sample, the average K–3 enrollment of rural schools was 330, about 200 students less than all other schools in the sample. While this average was above the enrollment where the "rules of thumb" suggest costs are higher, rural schools may warrant special attention. As was discussed, the high costs in smaller schools occur when a school has a small number of students above the "tipping" point that requires an additional teacher to meet the policy requirements. In urban areas, districts may have some flexibility in reassigning a small number of students to other schools to move the enrollment in that school below the tipping point, and thus avoid the higher costs. But rural schools, or any area with few neighboring schools, will have less flexibility in reassigning students, and as shown here face higher costs.

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[23] $394=($435/$53,000)*$48,000, $72=($80/53,000)*$48,000

# CHAPTER 4: REIMBURSEMENT STRATEGIES[24]

## INTRODUCTION

Once state level policymakers have decided to implement and pay for CSR, one issue they face is simply how to calculate the reimbursements to districts (or potentially schools). The previous chapter provided information on how policy decisions affect the cost of CSR at the school level. This chapter addresses different strategies for calculating the reimbursements of those costs. This chapter uses information developed in the previous chapter to inform policymakers about strategies to reimburse the cost of CSR. This analysis will help policymakers understand the appropriate methodology and how the quality of information interacts with the different reimbursement strategies. Exploratory analysis is used as a technique for examining the different funding strategies.

Two key questions decisionmakers face in setting a reimbursement strategy are examined here.

- What price should be used for classrooms, the sample-wide average prices or district average prices?
- At what level should the additional number of classrooms required for CSR be calculated, the state (sample in this example), district, or school level?

As reimbursement strategies move from the sample to the school level the amount of required information increases. Key issues are whether the information is available and whether it increases the efficiency of the strategy.

## METHODOLOGY FOR EVALUATING REIMBURSEMENT STRATEGIES

Reimbursement strategies are evaluated for the class size goal of 20 using the target and ceiling methods for single grade and K–3 reduction. Four different reimbursement strategies were compared:

A. **Sample-wide** estimates of the additional classrooms per student required for CSR using the sample average cost of new classrooms.

B. **District** estimates of the additional classrooms per student required for CSR using the district average cost of new classrooms.

C. **School**-level estimates of the additional classrooms per student required for CSR using the district average cost of new classrooms.

D. School-level estimates using the **rules of thumb** of the additional classrooms per student required for CSR using the district average cost of new classrooms.

The sample-wide strategy reflects the strategy used in California to pay for CSR, where a statewide, per-student rate is used to reimburse districts. The district-level strategy adapts the statewide strategy to reflect district-level class size and new teacher costs. The school-level strategy and the rules of thumb strategies are methods that use school-level information for estimating the cost of CSR.

All the reimbursement methods use information on existing class size, projected enrollment, and average prices to estimate the cost of CSR. Methods A, B, and C use a methodology similar to that used in the previous chapter. Estimates of existing class size and projected enrollment are used to estimate classrooms present without CSR. The class size goal and projected enrollment are used to estimate the number of classrooms needed for CSR. The difference is the number of classrooms needed for CSR. This number of classrooms is multiplied by the price of classrooms to reach the estimated reimbursement amount. The methods differ on the level in the system where the enrollment, class size and classroom cost are determined. Method A (Sample-wide) uses estimates of enrollment, average class size and average classroom cost at the sample level. Method B (District) uses the same information calculated at the district level. Method C (School level) uses enrollment and class size calculated at the school level with district-level prices for new classrooms.

The final method, D, applies the rules of thumb determined in the previous chapter with school-level information on enrollment and class size with district-level prices.

Method A uses the least information, while methods C and D use the most. The key question to be addressed here is how much does this additional information increase the accuracy of reimbursement rates at the district and school level.

## Defining an "Efficient" Reimbursement Strategy

The analysis compares each of the strategies with the "actual" cost of CSR. The cost of CSR predicted in the previous chapter will be termed the "actual" costs for CSR implementation in 1997. The efficiency of reimbursement strategies is evaluated at each level within the system: sample, district and school level. An efficient reimbursement scheme should match payments as closely as possible to actual costs. As discussed earlier, overpayments essentially become financial boons to districts (or potentially schools) taking state funds and giving discretion over their expenditure to local decisionmakers. Underpayments take funds away from district (or school) priorities and move them to CSR.

The evaluation methods are chosen to reflect the perspective of the institutions at that level. The efficient strategy at the sample level is the one with the closest estimates of

the total cost of CSR. Sample-level strategies are called the same if the difference between them is less than five percent of the "actual" cost of the policy.

Evaluation of the strategy efficiency at the district level uses the district as the unit of analysis, with each district weighted equally. So an efficient strategy at the district level is the strategy that best estimates the cost of CSR for all districts in the sample, as measured by the average percent absolute difference. The absolute percent difference is the absolute difference between the estimated reimbursement and the "true" cost, divided by the "true" cost for each district. The average absolute difference is the average of the absolute percent differences for all the districts. In other words a 10% underpayment in Dade is counted the same as a 10% overpayment in Alachua. Reimbursement strategies are considered equally efficient if the average percent absolute differences are within five percentage points.

The efficient strategy at the school level uses the school as the unit of analysis. This methodology selects the strategy that minimizes the total absolute difference between school-level costs and reimbursements. Many strategies estimated a reimbursement when there was no cost at the school level. This made estimating a percent difference at the school level difficult. In other words, it is impossible to estimate a percent difference when the denominator is zero. So to evaluate the strategies at the school level, the absolute differences were summed for the entire sample and divided by the sum of the cost for the entire sample. Strategies are the same if the difference between them is less than five percent of the total actual cost of the policy.

Exploratory analysis has been used in policy analysis in at least two ways. The first is to explore across uncertainty in model inputs and policy choices (model parameters) to gain a better understanding of model behavior across different ranges of input uncertainty and policy choices (Lempert, Schlesinger & Bankes, 1996, Park & Lempert, 1998). A second method is to explore across model outputs to gain a better understanding of model behavior and appropriate policy choices (Brooks, Bankes, & Bennett, 1997). In this case, the uncertainty in the model parameters is rather low, and the key issue instead is the impact of policies across the range of conditions at the district and school level. Here the focus of the analysis is on the differential effect of policies on districts and schools. The goal of the exploratory analysis is to find the strategy that is most robust for each of the four combinations of CSR policies, for all the units (sample, districts or schools) at the level being evaluated.

## DATA FOR EVALUATING REIMBURSEMENT STRATEGIES

The analysis above has shown that costs vary by large amounts based on school-level conditions (enrollment and class size), and district-level conditions (price of teachers). A key issue for determining a reimbursement scheme is what information is available when the CSR budgets are determined and when reimbursements are made. With perfect information, reimbursements can exactly match costs. But this perfect information is

only available after the beginning of the school year when budgets have already passed at the district and state level, and teachers should have already been hired to implement CSR. It may be possible to determine the exact reimbursements after the beginning of a school year, when enrollments are set and additional teachers hired. This is the most precise and accurate method of reimbursement.[25] But, even this method would require some prior estimates of cost during the budget cycle.[26]

The reimbursement strategies are evaluated using cost estimates created with information about 1997–98 school- and district-level conditions available to policymakers before the beginning of the school year. The enrollment estimates used were derived from the district-wide projected capital outlay FTE enrollments created the summer before the 1997–98 school year and the prior year's enrollments reported in the CCD. District growth rates for each grade were derived from the capital outlay FTE enrollment estimates. The growth rate was applied to 1996 school- and grade-level enrollments reported in the CCD to estimate the 1997 school-level enrollment rates. The class sizes used are those reported for the school in the prior year's Indicators reports.[27] Table 4.1 below shows the enrollment estimates and 1996 Indicator class sizes used to evaluate the reimbursements strategies and the actual class sizes and enrollments used to calculate the "actual" cost of CSR.

The estimated enrollment levels are very close to the actual enrollments. There are large differences between the actual and Indicators class sizes, with the 1996 Indicators class sizes being generally larger than the actual class sizes. The largest difference is in Alachua County where the Indicators class sizes were 18% larger than the actual class sizes. This difference may be due to the fact that the Indicators reports were averages for the entire school while the actual class sizes were only for grades K–3. This is also an example of issues raised in Chapter 1 regarding difficulties in measuring class size and finding accurate reports of class size. To investigate the importance of accurate class size information, reimbursement strategies were also evaluated with class size estimates that are 50% more accurate. The 50% more accurate class size estimates are shown in the far right column.

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[25] But this method could be difficult to implement and may produce counter-productive incentives for district behavior. Districts would face incentives to inflate enrollments and class sizes.

[26] Another issue that is beyond this analysis is simply the availability and political will to allocate sufficient resources for CSR.

[27] The simulation used in the above section is based on conditions in the 1997–98 school year. The enrollment estimates used for the reimbursement calculations are district-wide projected capital outlay FTE enrollment estimates made in August of 1997 for the 1997–98 school year. The class sizes are from the 1996–97 school year as reported in the school Indicators reports.

**TABLE 4.1 ACTUAL 1997 CLASS SIZE AND ENROLLMENT COMPARED TO ESTIMATES USED FOR CSR REIMBURSEMENT STRATEGIES**

| | 1997 Actual Enrollment | 1997 Actual Class | Estimated 1997 Enrollment | 1996 Indicator Class Sizes | 50% More Accurate Class Sizes |
|---|---|---|---|---|---|
| **Alachua** | 9,191 | 20.7 | 8,380 | 24.4 | 22.6 |
| **Broward** | 57,758 | 24.7 | 56,731 | 26.5 | 25.6 |
| **Dade** | 105,688 | 26.4 | 104,843 | 25.6 | 26.0 |
| **Hillsborough** | 54,077 | 21.9 | 52,605 | 24.2 | 23.0 |
| **Pinellas** | 43,885 | 21.7 | 43,042 | 23.0 | 22.3 |
| **Santa Rosa** | 7,548 | 20.5 | 7,713 | 22.4 | 21.1 |
| **Wakulla** | 1,693 | 23.4 | 1,562 | 22.8 | 23.1 |
| **Sample total** | 279,840 | 24.1 | 274,876 | 24.9 | 24.5 |

Source: FEFP, FL Class-Size Reports, Florida Indicators, August 1996 Capital FTE estimates

The same teacher salary used to estimate the 1997 "actual" costs were used to estimate the reimbursements. Decisionmakers will not have complete information about the next year's salary levels for new teachers, but use of the same teacher salary data does not detract from the conclusions drawn here.

## COMPARISONS OF REIMBURSEMENT STRATEGIES: SAMPLE LEVEL

The first comparison is made using data from the sample level between the actual cost of CSR and the four reimbursement schemes. The sample-level estimates are evaluated on their ability to accurately estimate the total cost of CSR. The comparison shown in Table 4.2 contains the total reimbursement estimates for all districts based on the different reimbursement schemes compared to the actual costs. The actual costs are show in the far left column.

TABLE 4.2 COMPARISON OF TRUE COSTS AND ESTIMATED COST WITH VARIOUS REIMBURSEMENT STRATEGIES USING ORIGINAL CLASS SIZE ESTIMATES (IN THOUSANDS)

| Policy Choices | True Cost | A. Sample Level | B. District Level | C. School Level | D. Rules of Thumb |
|---|---|---|---|---|---|
| Grades K–3 Target Method | $138,500 | $146,000 | $ 147,800 | $ 152,400 | $ 152,100 |
| Grades K–3 Ceiling Method | $151,200 | $146,000 | $ 147,900 | $ 165,900 | $ 162,000 |
| Single Grade Target Method | $36,100 | $36,500 | $ 36,900 | $ 38,800 | $ 38,500 |
| Single Grade Ceiling Method | $47,800 | $36,500 | $ 37,100 | $ 53,100 | $ 52,700 |

Source: FEFP, FL Class-Size Reports, Florida Indicators, August 1996 Capital FTE estimates

All of the reimbursement strategies result in relatively similar cost estimates with a larger divergence between the ceiling method estimates than for the target method estimates. For example, the difference between the highest and lowest K–3, target-method estimates is about $7 million, or about 5%. The most accurate estimate of the total costs were made at the sample level for both of the target-method estimates, at the district level for the four-grade ceiling method, and at the school level or the rules of thumb for the single-grade ceiling method.

Compare the estimated costs in Table 4.2 with estimates made using more accurate class size estimates shown in Table 4.3. The estimates in Table 4.3 were made with class size estimates that are 50% more accurate. The true cost does not change. But the remaining estimates all are now lower than the originals. This makes sense given that the class size estimates were generally too high. In general the increased accuracy of the class size estimates increases the accuracy of the strategies that are made at the lower level, i.e., the school level, compared to the sample-level strategy estimates, which became less accurate. The rules of thumb estimates are slightly closer to the actual costs than the school-level strategy for both of the single-grade cost estimates and for the ceiling method for grades K–3. The district-level strategy is more accurate for reduction in grades K–3 using the target method.

**TABLE 4.3 COMPARISON OF TRUE COSTS AND ESTIMATED COST WITH VARIOUS REIMBURSEMENT STRATEGIES USING MORE ACCURATE CLASS SIZE ESTIMATES (IN THOUSANDS)**

| Policy Choices | True Cost | A. Sample Level | B. District Level | C. School Level | D. Rules of Thumb |
|---|---|---|---|---|---|
| Grades K–3 Target Method | $138,500 | $135,500 | $ 136,800 | $ 144,900 | $ 144,300 |
| Grades K–3 Ceiling Method | $151,200 | $135,500 | $ 136,900 | $ 158,300 | $ 154,400 |
| Single Grade Target Method | $36,100 | $33,900 | $ 34,200 | $ 36,700 | $ 36,600 |
| Single Grade Ceiling Method | $47,800 | $33,900 | $ 34,400 | $ 51,100 | $ 50,700 |

Source: FEFP, FL Class-Size Reports, Florida Indicators, August 1996 Capital FTE estimates

For overall estimates of the cost of CSR, the accuracy of different reimbursement strategies depends on the accuracy of the information used to make the estimate. This is summarized in Table 4.4 below. The cost estimate strategies were generally more accurate at the higher levels of the system using the original class size information, which was generally higher than the actual class sizes. But when the accuracy of the class size information was increased, the estimates made using the rule of thumb became more accurate.

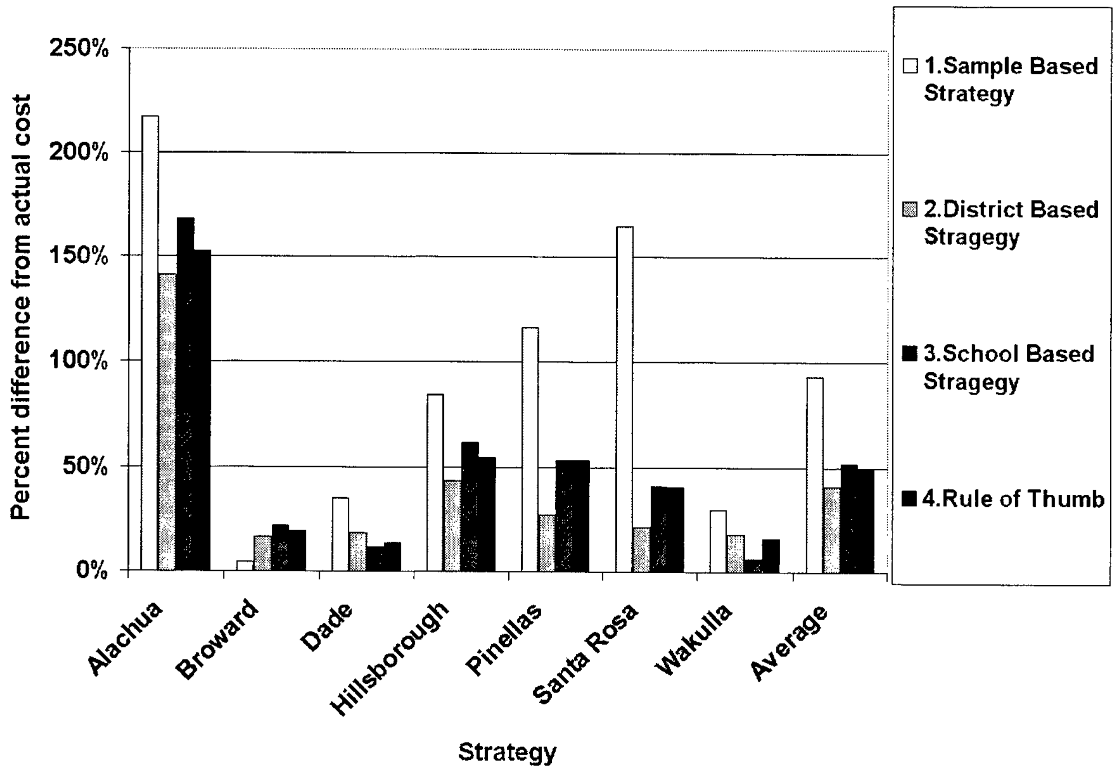
**TABLE 4.4 RELATIVE PERFORMANCE OF VARIOUS REIMBURSEMENT STRATEGIES AT THE SAMPLE LEVEL**

| | Accuracy of Class Size Information | |
|---|---|---|
| **Policy Choices** | **Original Class Size Information** | **Class Size That Is 50% Closer to Actual** |
| **Grades K–3 Target Method** | A. Sample | A. Sample, B. District, C. School, D. Rules of Thumb |
| **Grades K–3 Ceiling Method** | A. Sample, B. District | Rule of Thumb |
| **Single Grade Target Method** | A. Sample, B. District | B. District, C. School, D. Rules of Thumb |
| **Single Grade Ceiling Method** | C. School, D. Rules of Thumb | C. School, D. Rules of Thumb |

## COMPARISONS OF REIMBURSEMENT STRATEGIES: DISTRICT LEVEL

The next level of comparison is at the district level. Here the issue is not whether the total cost of CSR has been estimated accurately, but instead how well the reimbursement strategy matches each district's costs. The analysis explores across the districts for the most robust strategy. Figure 4.1 shows the absolute percent difference between the actual cost and the reimbursement for the four different strategies for K–3 implementations using the ceiling method and the more accurate enrollment estimates. Remember that the percent absolute difference is the absolute difference divided by cost.

**FIGURE 4.1 PERCENT ABSOLUTE DIFFERENCE BETWEEN ACTUAL AND REIMBURSED COST**




Source: FEFP, FL Class-Size Reports, Florida Indicators, August 1996 Capital FTE estimates

Each bar shows how large the absolute difference is between the actual cost and the reimbursed rate for a given strategy for each district. For example, the sample-based strategy reimburses Santa Rosa district by $2 million more than the actual cost of $1.25 million. All differences are shown as positive when using the absolute difference. So an overpayment of 25% is represented in the same way as an underpayment of 25%. Both an overpayment and underpayment represent a diversion of funds away from the intended use, so each is shown as equally divergent. Of course an underpayment has radically different effects on a district or school than an overpayment. As another example, the district-based strategy reimburses Dade District $16 million less than the actual cost, which is an 18% underpayment. The actual differences are shown in Appendix 8.

The key issue to note is that there is not a unifying strategy that is best for all districts. The district-based strategy is best for Santa Rosa County, and the school-based strategy is best for Wakulla. But it is clear that the district-based strategy is better for most districts. The final set of columns shows the average absolute difference. This is the average of the percent difference for each district, thus each district is weighted equally.

The average absolute difference is used as a measure to compare strategies at the district level.

A summary of which strategy is more accurate for each policy choice and for different levels of class size accuracy is provided in Table 4.5 below. The most accurate strategy is the one with the smallest average percentage of absolute difference. The district strategy was the robust strategy across these combinations of policy choices and information.

**TABLE 4.5 RELATIVE PERFORMANCE OF VARIOUS REIMBURSEMENT STRATEGIES AT THE DISTRICT LEVEL**

| | Accuracy of Class Size Information | |
|---|---|---|
| **Policy Choices** | **Original Class Size Information** | **Class Size That Is 50% Closer to Actual** |
| **Four Grade Target Method** | B. District | B. District, C. School |
| **Four Grade Ceiling Method** | B. District | B. District |
| **Single Grade Target Method** | B. District, C. School, D. Rules of Thumb | B. District, C. School, D. Rules of Thumb |
| **Single Grade Ceiling Method** | B. District | C. School, D. Rules of Thumb |

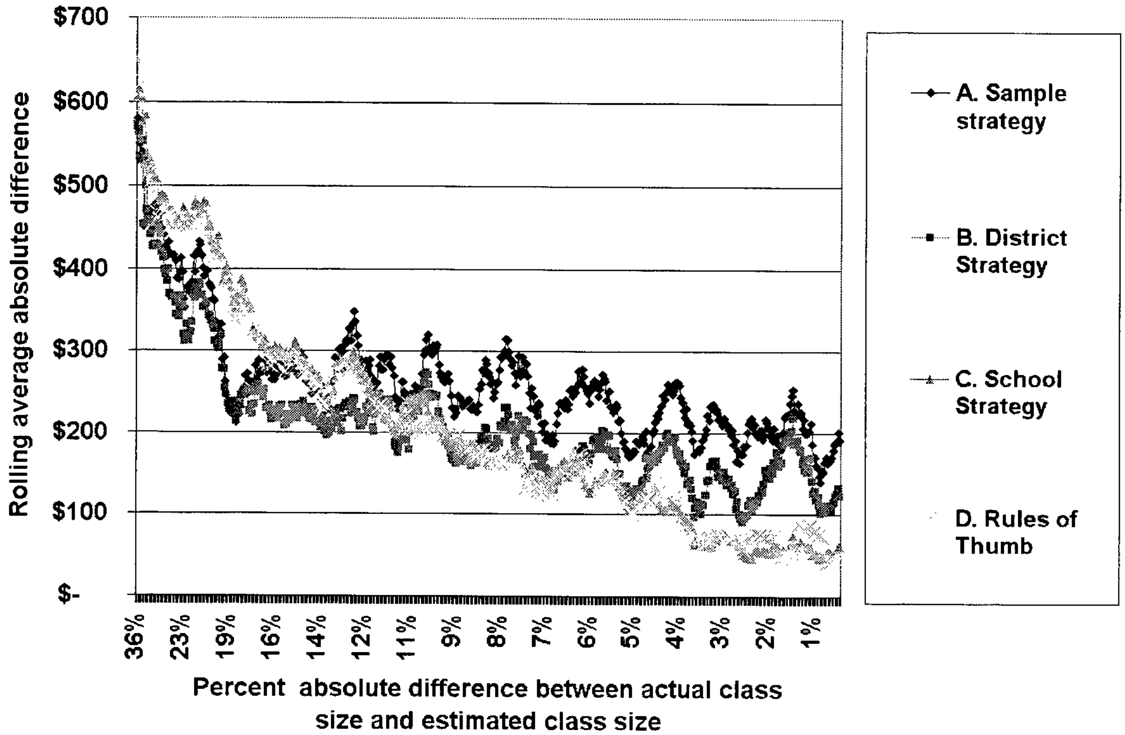
The previous section showed that strategies using information from schools (rules of thumb and school-level predictions) created better estimates of total costs. The district-level strategy appears to be more robust in predicting district-level costs.

## COMPARISONS OF REIMBURSEMENT STRATEGIES: SCHOOL LEVEL

The final level at which to compare reimbursement strategies is the school level. As with the district-level analysis, the absolute difference between the cost of CSR at the school level and the reimbursed amount is the measure of efficiency. In this case the comparisons are made across schools. The state and district reimbursement rates (in dollars per student) are applied to the enrollment at each school to calculate a dollar amount reimbursed to each school. The school-level and rules of thumb strategies are, by definition, calculated at the school level.

Figure 4.2 shows the relative accuracy of each reimbursement rate as a function of the accuracy of the estimated class size using the target method. The same figure for the ceiling method is located in Appendix 8. To more clearly show trends, each point is a 20-school rolling average difference between actual and reimbursed amounts. The rolling average smoothes trends and makes them easier to see.

**FIGURE 4.2: SCHOOL-LEVEL COMPARISON OF REIMBURSEMENT STRATEGIES AND COST FOR REDUCTION FOR GRADES K–3 USING THE TARGET METHOD**




Source: FEFP, FL Class-Size Reports, Florida Indicators, August 1996 Capital FTE estimates

The y-axis of the figure is the rolling average absolute difference between actual cost and amount reimbursed for each strategy. The x-axis of the figure is the absolute percent difference between the actual class size and the estimated class size using the 1996 Indicators reports.

The issue highlighted by this exploration across schools is the relationship between the accuracy of class size information and reimbursement strategies. As the accuracy of class size information increases, moving from left to right on the x-axis, the relative efficiency of methods that use school-level information increases. The sample-level and district-level strategies are more accurate when class size estimates are less accurate. Looking at the far left portion of the graph, class size information is the least accurate and the strategies at the sample and district level (A & B) are most accurate. At a difference in

class size of about 10%, the rules of thumb and school-level strategies become more accurate than the district- and sample-level strategies. With the most accurate class size information, the difference between actual and estimated costs is about $200 per student using the sample-level strategy and about $125 per student using the district-level strategy. This can be compared to both strategies that use school information, which average a $50 difference from actual costs. As seen earlier, there is little difference between the rules of thumb and school-level strategies, confirming the ability of the rules of thumb to accurately predict CSR costs.

Table 4.6 shows the relative performance of the different methods. The performance of the methods was judged by the sum of absolute differences of total cost per school across the entire sample. This metric was chosen to keep a school-level focus on costs. Two results are clear. First, many of the cells are filled by more than one strategy. There was relatively little difference between the performance of multiple strategies for some of the combinations of accuracy of information and policy choices. Second, the rules of thumb strategy is the most robust strategy at this level. The rules of thumb were most accurate, or one of the most accurate, for all of the policy combinations examined.

**TABLE 4.6 RELATIVE PERFORMANCE OF VARIOUS REIMBURSEMENT STRATEGIES AT THE SCHOOL LEVEL**

| | Accuracy of Class Size Information | |
|---|---|---|
| **Policy Choices** | **Original Class Size Information** | **Class Size That Is 50% Closer to Actual** |
| **Grades K–3 Target Method** | B. District, C. School, D. Rules of Thumb | C. School, D. Rules of Thumb |
| **Grades K–3 Ceiling Method** | B. District, C. School, D. Rules of Thumb | C. School, D. Rules of Thumb |
| **Single Grade Target Method** | B. District, D. Rules of Thumb | D. Rules of Thumb |
| **Single Grade Ceiling Method** | D. Rules of Thumb | D. Rules of Thumb |

The CSR reimbursement strategy chosen can have serious effects on districts and schools. Strategies that do not reimburse the total cost of the reform leave administrators with the choice of diverting resources from other functions or not fully implementing the reform. In this limited sample, cost estimates made using school information either through the rules of thumb or the school level are more accurate methods of reimbursing schools for their CSR expenditures. District-level information was best at estimating the district-level

costs of CSR. The use of average prices may have contributed to the sample-level strategy's poor performance compared to the other strategies. In other words, taking into account differences in teacher salaries is important in making accurate estimates of reform costs.

## CONCLUSIONS

This chapter addresses methodologies for estimating costs for setting reimbursements for CSR. These findings are more difficult to generalize since they depend on a small number of cases for their evaluation. The rules of thumb and three other reimbursement strategies were evaluated in their ability to estimate the cost of CSR. The strategies used different levels of information regarding prices, class sizes and enrollments. In this sample, it was clear that the level of information needed to match the level of reimbursement. District-level information was most efficient if districts were to be reimbursed. In other words, district-level information estimates, in this simulation, were the appropriate level of information for the current system where funds flow from the state to districts. School-level information, employed with the rules of thumb or the school-level estimates, was most efficient at estimating school-level costs.

Clearly using more detailed information improved the accuracy of cost estimates. The sample-level strategy was generally the worst strategy for reimbursing costs at all levels, especially when class size information was accurate. In this simulation, the district-level strategy was robust for estimating district reimbursements. A key element of the district-level system is the consideration of variation in teacher costs across districts. The district-level strategy was not a robust funding strategy for funding to the school level. This analysis suggests that direct funding to the school level requires consideration of school-level conditions to be efficient.

The reimbursement simulations highlight how policies that distribute equal amounts per student are very poor at meeting actual costs at the district and school level. Reimbursing districts or schools at a lower rate because of pre-existing small class sizes does raise important questions. This can be seen as punishing the districts that have already devoted resources to maintaining smaller classes. The key issue is whether differences in class sizes across districts are a result of educational choices to meet local needs or the result of variations in available resources. Picus (1994) found that lower pupil-teacher ratios are weakly related to locale (rural vs. suburban), lower enrollment, and higher expenditures. Parish (1996) found that lower student-to-teacher ratios were found in school districts with the lowest and the highest income households. The lower student-teacher ratios in low-income districts may represent the use of categorical aid, possibly for pull-out programs, and may not reflect actual class sizes. Carroll, Guarino and Reichardt (2000 forthcoming) found that schools with larger student-teacher ratios than the district average have higher minority enrollments.

To the extent that local conditions such as locale and low enrollment reflect the educational needs of students, creating local needs for smaller classes before CSR implementation, then districts with pre-existing small classes should not be "punished" by reducing their share of CSR funding. But if these conditions simply reflect more resources for education, or higher costs, then reduced CSR funding for these districts actually increases equality between districts.

# CHAPTER 5: TEACHER QUALIFICATIONS, AN UNINTENDED COST OF CSR[28]

## INTRODUCTION

This chapter describes some of the unintended consequences and costs of CSR in California in terms of teacher qualifications and equitable distribution of qualified teachers. This is an additional non-pecuniary "cost," or externality, to CSR that policymakers need to understand as they contemplate large system-wide reforms. The chapter addresses three main questions:

- Was there a cost in terms of declining teacher qualifications during CSR implementation in California?
- Was there an equity cost in terms of the distribution of qualified teachers during CSR implementation in California?
- If there was an equity cost, what was the flow of teachers that caused it?

Following a brief discussion of the data and methods used, these questions are addressed in two sections. The first examines the overall changes in the California K–3 workforce during the first three years of CSR and places them in the context of changes that occurred in the entire K–12 teacher workforce. This section goes on to examine the distributional changes in teacher qualifications, and again these distributional changes are placed in the context of those occurring for teachers in other grades. The second section examines the mechanisms that have caused these changes in the distribution of qualified teachers. It first examines the qualifications of novice teachers across schools with different student populations. Then the flow of K–3 teachers is modeled out of classrooms after 1995–96, and into K–3 classrooms in 1996–97. These models are used to isolate the relationship between student characteristics and the likelihood that existing teachers will leave the school and new teachers will not be fully credentialed, while controlling for economic conditions.

## DATA AND METHODS USED TO DESCRIBE THE TEACHER QUALIFICATION COST OF CSR

This portion describes the data and methods used to describe the costs of CSR in terms of teacher qualifications for the two sections of the analysis, as described above.

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[28] Portions of this chapter were reported earlier in Stecher & Bohrnstedt (2000).

Each analysis uses slightly different data sets with different sources of information about schools. The analysis of teacher distribution uses a data set created for the evaluation of California's CSR program and contains relatively more detailed information about school characteristics taken from the California Basic Educational Data System (CBEDS). The analysis of teacher movement uses information about schools taken from the CCD, which in addition to information about schools also contains information about districts. The teacher movement analysis also uses information on county-level characteristics from the Bureau of Labor Statistics (BLS), the California Department of Finance (CA DoF), and the California Employment Development Department (CA EDD). The source of data on teacher characteristics for both data sets is the Professional Assignment Information Form (PAIF).

The PAIF is completed in early October each year by all professional school staff and is entered into the CBEDS. Through the PAIF, teachers provide information about themselves, including demographics, education level, amount of experience, and credential status, as well as information on the classes they teach.

For this analysis, a K–5 teacher was defined as a teacher who is assigned to a "self-contained" classroom with between 14 and 50 students in grades K–5.[29] Teachers with students in both third and fourth grade were counted as K–3 teachers. Teachers in classes that included some combination of grades 4–8 were not included.[30] This broad definition was used to make sure all the relevant teachers were captured. As a result, the data set includes a few part-time teachers (less than 4% of the sample). Sixth-grade teachers were not included in this analysis since about half of them report teaching in departmentalized (as opposed to self-contained) classrooms.

For grades 7 and 8 and 10–12, a teacher was defined as one who teaches in departmentalized classrooms and spends the plurality of his/her time teaching classes in which the majority of students are in the stated grade range.[31] This category does not include administrators, those with other instructional related assignments (such as resource specialists, independent study teachers, or homeroom teachers), and special education teachers.

## Teacher Characteristics

Teacher "quality" is a concept that is both poorly defined and difficult to measure. The analyses reported here focus on three teacher characteristics that are generally believed to be associated with qualification level: teaching experience, education level, and

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[29] The sample is limited to elementary teachers who worked in the 4,774 elementary schools in the state in 1995–96. This sample of schools was defined by the California CSR evaluation team.

[30] The number of teachers in combination classes including grades 4–8 declined slightly between 1995–96 and 1998–99, from 4,700 to 4,400.

[31] Some ninth-grade teachers are in junior high schools and others are in high schools. As was done with the sixth-grade teachers, they were left out of the analysis to ensure that the patterns could be cleanly interpreted.

credentialing. It is important to remember that these characteristics may be related to quality, but they are not direct measures of a teacher's classroom effectiveness.[32]

In looking at teaching experience, a teacher who was in the first three years of teaching was defined a novice.[33] All other teachers were classified as experienced. As teachers become more experienced, their pay typically increases according to district salary schedules, implicitly because of the added value of their experience to the school system [34]

For education level, teachers were separated into two groups for these analyses: those with a bachelor's degree and those with education beyond a bachelor's degree. Just under 0.6 percent of the total K–5 teacher workforce reported having less than a bachelor's degree. These teachers are included in the bachelor's degree only category. All other teachers reported having at least 30 semester hours beyond a bachelor's degree. Teachers in the bachelor's degree only category can be viewed as those meeting only the minimum educational requirement for entry into the teaching profession. As with experience, education increases teachers' salaries—a signal that school districts value better-educated teachers in their classrooms.

For credentialing status, too, teachers were assigned to one of two categories. During the period being examined, the PAIF questions about credentialing changed. To retain a degree of comparability across the years, teachers were classified as fully credentialed or not fully credentialed. Table 5.1 shows the various responses teachers could have provided on the PAIF and how those answers mapped into the two credential categories. Many teachers marked more than one response. If any one of a teacher's responses fell into the fully credentialed classification, that teacher was classified as fully credentialed[35].

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[32] Similar measures of teacher qualifications are found in Henke et al., 1997, and Kirby, Naftel, & Berends, 1999.

[33] The three-year period for a novice teacher was selected to approximate the probationary, pre-tenure period.

[34] Because a large share of teachers did not report their experience in 1996–97, data on teacher experience for that year is either not included in this report or is derived from an adjacent year's values. Derived values are identified with footnotes.

[35] There also were significant changes, by year, in the number of non-responses to the credentialing question on the PAIF. In 1995–96, the K–3 non-response rate was 4.4 percent; in 1996–97, it was 5.6 percent; in 1997–98, it was 2.4 percent; and in 1998–99, it was 0.5 percent. Non-responses were dropped from the analysis. Alternative clusters of credential responses were tried; none of them affected the basic trends reported in this chapter.

**TABLE 5.1 CREDENTIAL CLASSIFICATIONS**

| Classification | Teacher Responses on PAIF: 1995–96 and 1996–97 | Teacher Responses on PAIF: 1997–98 and 1998–99 |
|---|---|---|
| **Fully Credentialed** | Adult vocational education | Full |
| | Elementary | |
| | Secondary | |
| | Specialist | |
| **Not Fully Credentialed** | Trainee | University internship |
| | Emergency | District internship |
| | | Emergency |
| | | Waiver |

# SECTION 1: OVERALL AND DISTRIBUTIONAL CHANGES IN THE TEACHER WORKFORCE

## School Characteristics for Analysis of Teacher Distribution

For the examination of the teacher distribution, school classifications created as part of the California CSR evaluation are used. The California CSR evaluation team categorized California's elementary schools along three dimensions.[36] These categories were based on student characteristics: percentage of students receiving Aid to Families with Dependent Children (AFDC) (i.e., low-income students), percentage of ELL students, percentage of minority (non-white) students and percentage of Hispanic students.[37] [38] To create these cutpoints, schools were ranked within these categories and assigned to groups of similar schools. Groups contained similar numbers of schools, when possible, and were not weighted by number of students or teachers.[39] Categorizations were based

[36] Of the original sample of 4,774 elementary schools used in this analysis, 21 did not have K–3 teachers who met the definition being used.

[37] Note that the measure of student poverty used in the distributional analysis (percent eligible for AFDC) is different from the one used in the movement (percent free lunch eligible). This is because each analysis employs different data sets. The CBEDS data used in the distributional analysis was rich in school-level descriptors but cumbersome to integrate with district-level descriptors. The CCD based data set used in the movement analysis is less rich in the school descriptors, but easier to integrate with district-level information.

[38] Students for whom English is a second language and who are not fully proficient in English are often referred to as limited English proficient (LEP), English language learners (ELL).

[39] These cutpoints were determined by members of the California CSR evaluation team.

on conditions during the first year of CSR, 1996–97. The minority, poverty, and English language learners (ELL) categories have four ranked groups (i.e., quartiles). The Hispanic categories have three ranked groups. Complete definitions and information on the number of schools and K–3 teachers in each grouping can be found in Appendix 9.[40]

At the middle and high school levels, schools were grouped into clusters using the same cutpoints applied at the elementary level. This produced four groups, but they were not always of equal size. The middle school and high school analyses were only conducted for percent minority and percent low-income.

## Methods for Analysis of Teacher Distribution

Teacher characteristics are compared for the four years that began with the 1995–96 school year (the year before CSR was implemented) and ended with the 1998–99 school year (the third year of CSR implementation). Changes in the gap between teacher qualification levels in quartile 1 and quartile 4 provided a measure of distributional changes.[41] In the results that follow, the differences between mean qualification levels in quartile 1 and 4 were statistically significant at the 0.01 level for elementary teachers unless otherwise indicated.[42]

To present the findings in the clearest way, the focus is limited in this chapter to changes in teacher qualification levels with relation to schools having different proportions of low-income students. Appendix 9 contains information on the changes in the K–3 and grade 4 and 5 workforces related to proportion of minority, ELL and Hispanic students. Appendix 9 also contains basic information on the size of the grade 7 and 8 and 10–12 workforces and on changes in these workforces in relation to proportions of low-income and minority students.

## General Changes in the K–3 Teacher Workforce

This part begins by looking at general changes in the K–3 teacher workforce. In 1996–97 and 1997–98 (the first two years of CSR), California's teacher workforce grew at a rate of

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[40] Between 1996–97 and 1998–99, reported proportions of low-income students showed great variation for some schools. Repeating the elementary grade analysis without schools that had a one-year change of 15 percentage points or more in the proportion of low-income students did not change the trends reported.

[41] The differences between schools with the most students of a certain type (e.g., minority) and schools with the fewest students of that type are referred to as the differences between quartiles 1 and 4. This is technically not accurate for the Hispanic grouping, since there are three Hispanic groupings. The differences between Hispanic groupings 1 and 3 are similar to the differences between quartiles 1 and 4 for low-income, ELL, and minority students.

[42] All elementary analyses were repeated with the Los Angeles Unified School District (LAUSD) excluded. LAUSD employs 14 percent of the teachers in the sample; its exclusion caused no changes in the overall results. The differences in the means between quartile 1 and 4 schools within a year remained statistically significant at the 0.05 level, although the gap between quartiles 1 and 4 was generally reduced.

19 and 16 percent, respectively. In 1998–99, the growth rate slowed to 6 percent.[43] Table 5.2 shows the basic demographics of the K–3 workforce between 1995–96 and 1998–99.

**TABLE 5.2 DEMOGRAPHIC CHANGES IN K–3 TEACHER WORKFORCE FROM 1995 TO 1998**

| Demographics | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|
| Total number of K–3 teachers | 62,226 | 73,959 | 85,814 | 91,112 |
| Percentage of first-year teachers | 6 | N/A[a] | 12 | 10 |
| Mean number of students per teacher | 28.9 | 24.9 | 21.1 | 19.9 |
| Percent white | 74 | 73 | 72 | 71 |
| Percent Hispanic | 14 | 15 | 16 | 17 |
| Percent Asian | 6 | 6 | 6 | 6 |
| Percent African American | 5 | 5 | 5 | 4 |
| Percent American Indian | 0.6 | 0.6 | 0.6 | 0.6 |
| Percent Male | 8 | 8 | 9 | 9 |

Note: Similar information on teachers in grades 4 and 5, 7 and 8, and 10–12 is presented in Appendix 9.
[a] Measures of teacher experience were not available for 1996–97 because numerous data were missing in that year.
Source: CBEDS-PAIF.

By 1998–99, the total number of K–3 teachers was just over 91,000. By that year, the K–3 workforce was more male and more Hispanic while the proportion of white teachers had declined. The proportion of teachers in their first year of teaching grew from 6 percent in 1995–96 to 12 percent in 1997–98. In 1998–99, it fell to 10 percent.

Although the changes in the K–5 workforce occurred during the time the CSR program was being implemented, the changes cannot be attributed solely to the program. CSR undoubtedly was a major influence on the elementary teacher labor market and thus a likely cause of at least some of the changes. But other factors have had an impact as well—e.g., changes in opportunities available to teachers and would-be teachers because of an improved economy, and increased enrollments in all grades. Thus information is included on changes in teacher qualifications in middle and high school to provide contextual information on the changes affecting the entire teacher workforce. Given that

[43] A simple, back-of-the-envelope, calculation indicates that almost all of the growth in the number of K–3 teachers is due to CSR. If the class size reported in 1995–96 were maintained, the number of teachers in 1996–97 through 1998–99 would be roughly 64,000, 63,000 and 63,000 respectively.

teaching in grades 7 and 8 and in grades 10–12 requires different certification than teaching in K–5 does, CSR is less likely to have directly influenced the teacher workforces in these higher grades than in K–5.[44] The declines in teacher qualifications in high school and, to a lesser extent, in middle school should serve as an indication of the type and size of changes caused by factors other than CSR.

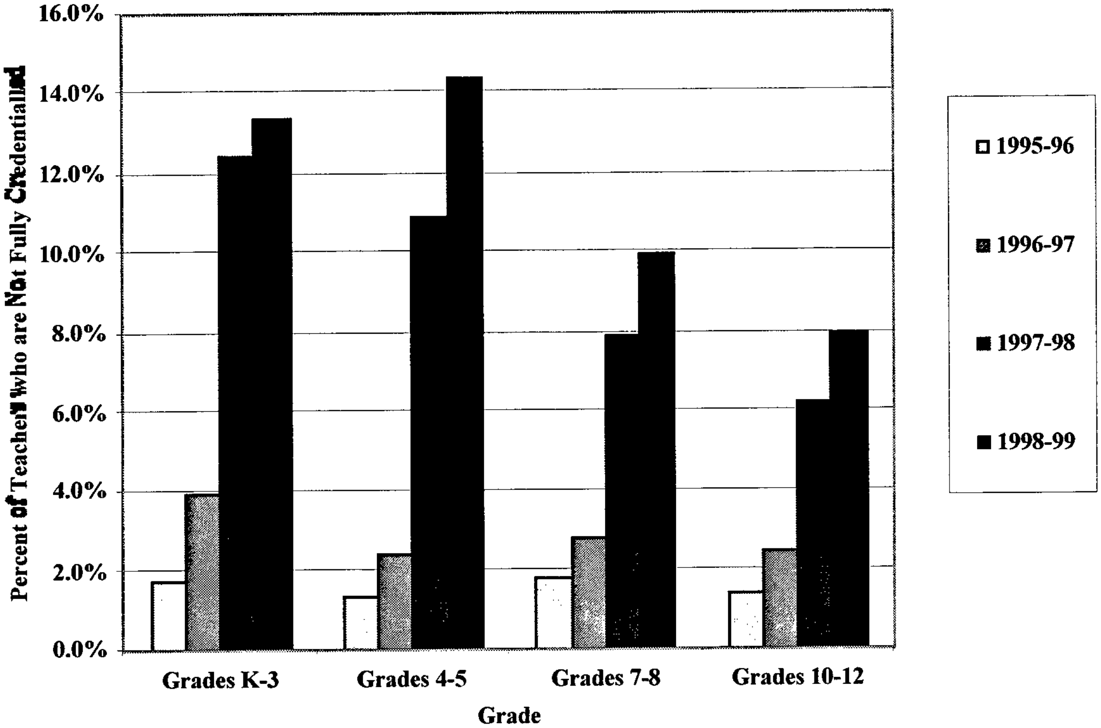
Figure 5.1 shows the overall changes in credentialing levels for teachers in grades K–3 and compares them to changes in credentialing levels for teachers in grades 4 and 5, 7 and 8, and 10–12. Each bar shows the percentage of not fully credentialed teachers for a given year. The key point to note is that while there was an increase in the proportion of not fully credentialed teachers in all four-grade groupings, the two elementary grade groupings showed the largest increase.

In 1995–96, all four grade groupings had relatively similar proportions of not fully credentialed teachers, between 1.3 and 1.8 percent. Between 1996–97 and 1998–99, while CSR was being implemented, the proportion of not fully credentialed teachers increased in each group. By 1998–99, 13.4 percent of K–3 teachers were not fully credentialed, compared to 7.9 percent of grade 10–12 teachers. The proportion of grade 4 and 5 teachers not fully credentialed was 14.4 percent, which is even higher than the percentage for K–3 teachers. These patterns were true for all three measures of teacher qualifications: credentialing, education, and experience.

The rate of decline in teacher credentialing slowed in 1998–99. The proportion of not fully credentialed K–3 teachers grew by 8.7 percentage points between 1995–96 and 1996–97, but by only 0.9 percentage point between 1997–98 and 1998–99. The change in the proportion of not fully credentialed teachers between 1997–98 and 1998–99 was larger for the other three grade groupings than it was for K–3, with the largest increase, 3.5 percentage points, in grades 4 and 5.

[44] See the California Commission on Teacher Credentialing at http://www.ctc.ca.gov/credentialinfo/credinfo.html.

**FIGURE 5.1 CHANGES IN PROPORTION OF NOT FULLY CREDENTIALED TEACHERS[45]**




Source: CBEDS-PAIF.

Figure 5.2 shows changes in the proportion of teachers with only a bachelor's degree. As was true of the proportion of teachers not fully credentialed, the proportion of teachers with only a bachelor's degree increased across all four grade groupings. And, as before, the larger increases were in the elementary grades, with the largest increase in grades 4 and 5. Another similarity was that the increases in the proportion of K–3 teachers with only a bachelor's degree slowed in 1998–99.

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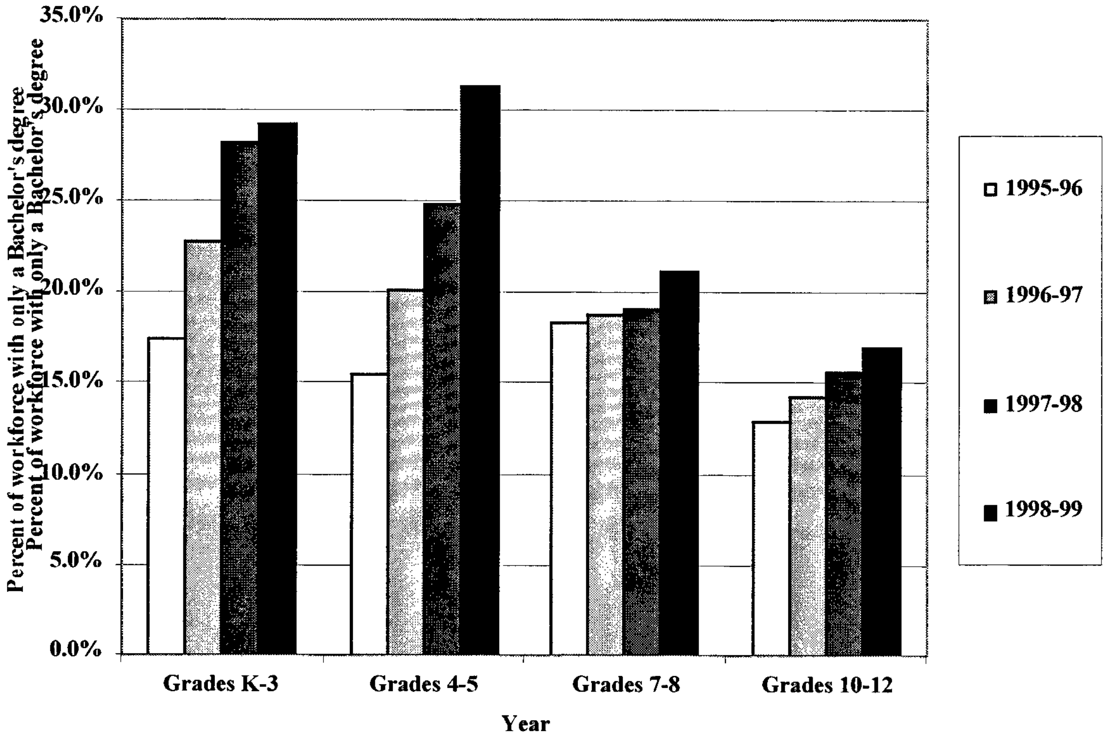
[45] During this period there was continuous growth in the enrollment for each of the grade groupings. Enrollment in K–3 was 1,827,000 in 1995 and grew at an annual rate of 2.8%, 1.4% and 0.9% between 1995 and1998 respectively. Enrollment in grades 4–5 was 853,000 in 1995 and grew at an annual rate of 1.1%, 2.6% and 3.2% between 1995 and 1998. Enrollment in grades 7–8 was 809,000 in 1995 and grew at an annual rate of 1.7%, 2.0% and 2.0% for each year between 1995 and 1996. Enrollments in grades 10–12 was 1,027,000 in 1995 and grew at an annual rate of 4.7%, 4.2% and 3.5% between 1995 and 1998.

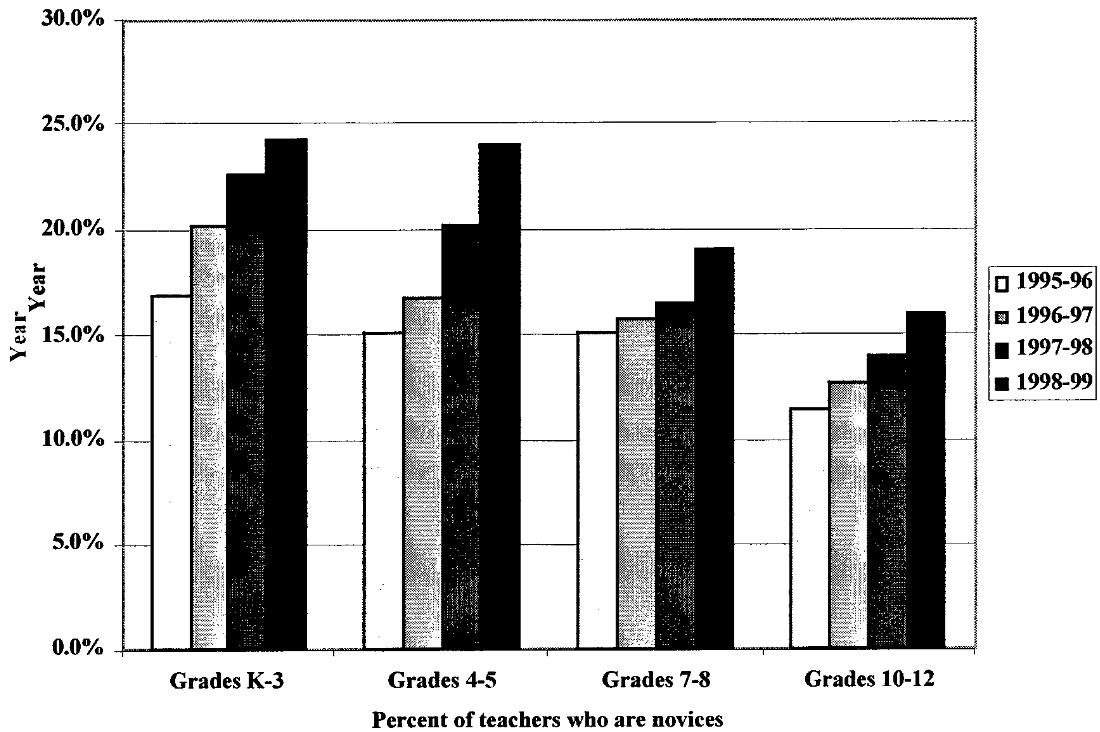
**FIGURE 5.2 CHANGES IN PROPORTION OF TEACHERS WITH ONLY A BACHELOR'S DEGREE**




Source: CBEDS-PAIF.

Figure 5.3 shows the changes in the proportion of novice teachers (i.e., those in their first three years of teaching). As can be seen, the pattern of changes is repeated here. The proportion of novices increased across all grade groupings, with the largest increases in the elementary grade groupings. By 1998–99, about 30 percent of K–5 teachers were novices, compared to between 17 and 20 percent of teachers in grades 7 and 8 and 10–12. Here again, the proportion of novices in grades 4 and 5 increased beyond the proportion in K–3.

FIGURE 5.3 CHANGES IN PROPORTION OF NOVICE TEACHERS




Note: Percentages shown for 1996–97 are averages of percentages for adjacent years because large amounts of data were missing in that year.
Source: CBEDS-PAIF.

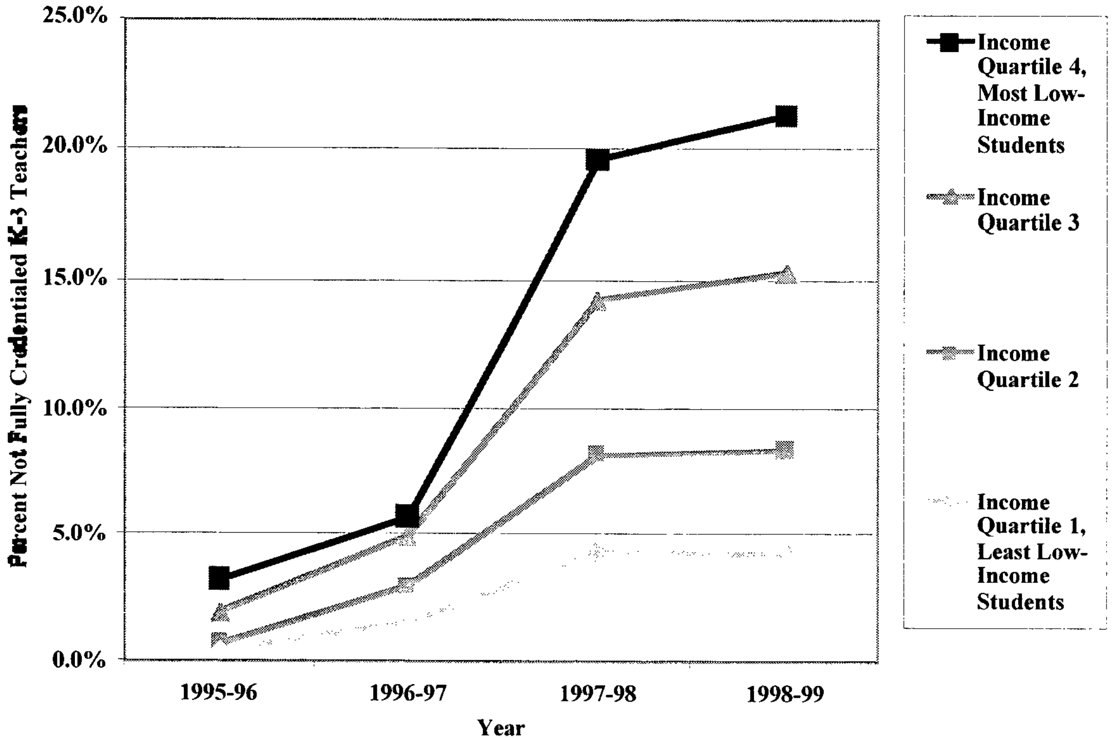
## K–3 Teacher Qualifications and School Characteristics

The analysis now turns to the findings on K–3 teacher qualification levels across schools with different proportions of students classified as low-income. Unless stated otherwise, the patterns described are similar to those seen when schools are classified by proportion of ELL students, minority students in general, and Hispanic students in particular. Results for these latter classifications are presented in Appendix 9.

Figure 5.4 shows the distribution of not fully credentialed K–3 teachers in schools with different proportions of low-income students. The gap in teacher qualification levels between schools that served larger and smaller proportions of low-income students grew as CSR was being implemented. For example, in 1995–96, there was a gap of about 3 percentage points in the proportion of not fully credentialed teachers in schools that served the smallest and largest proportions of low-income students (0.4 percent compared to 3.2 percent). This gap grew to 17 percentage points by 1998–99. The growth in this gap between 1997–98 and 1998–99 was due to an increase from about 20

percent to 21 percent in the proportion of not fully credentialed teachers in schools that serve the largest proportions of low-income students. At the same time, the proportion of teachers in schools with the smallest proportion of low-income students remained steady at about 4 percent.

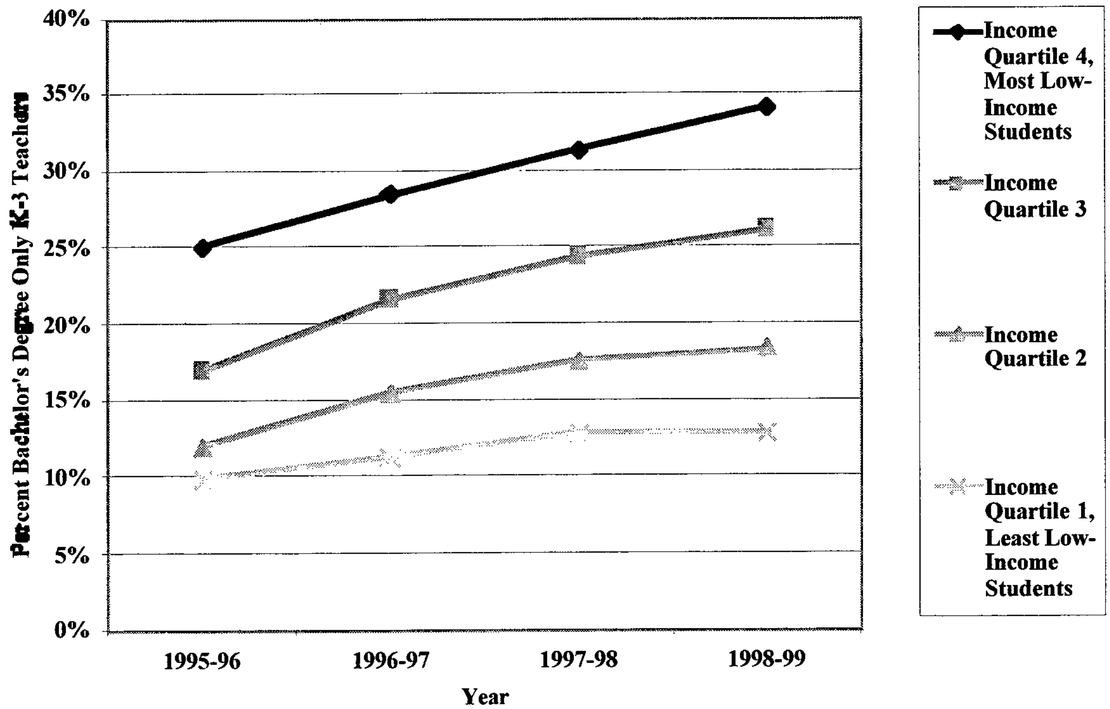
**FIGURE 5.4 PERCENTAGE OF K–3 TEACHERS NOT FULLY CREDENTIALED IN SCHOOLS WITH DIFFERENT PROPORTIONS OF LOW-INCOME STUDENTS**




Source: CBEDS-PAIF.

Figure 5.5 shows the proportion of K–3 teachers with only a bachelor's degree across schools with different proportions of low-income students. The pattern here is similar to what was seen for teacher credentials: the proportion of teachers with only a bachelor's degree remained relatively steady in schools serving the fewest low-income students but grew in schools serving the most low-income students. In 1995–96, the gap was 15 percentage points. After three years of CSR implementation, it had grown to 22 percentage points.

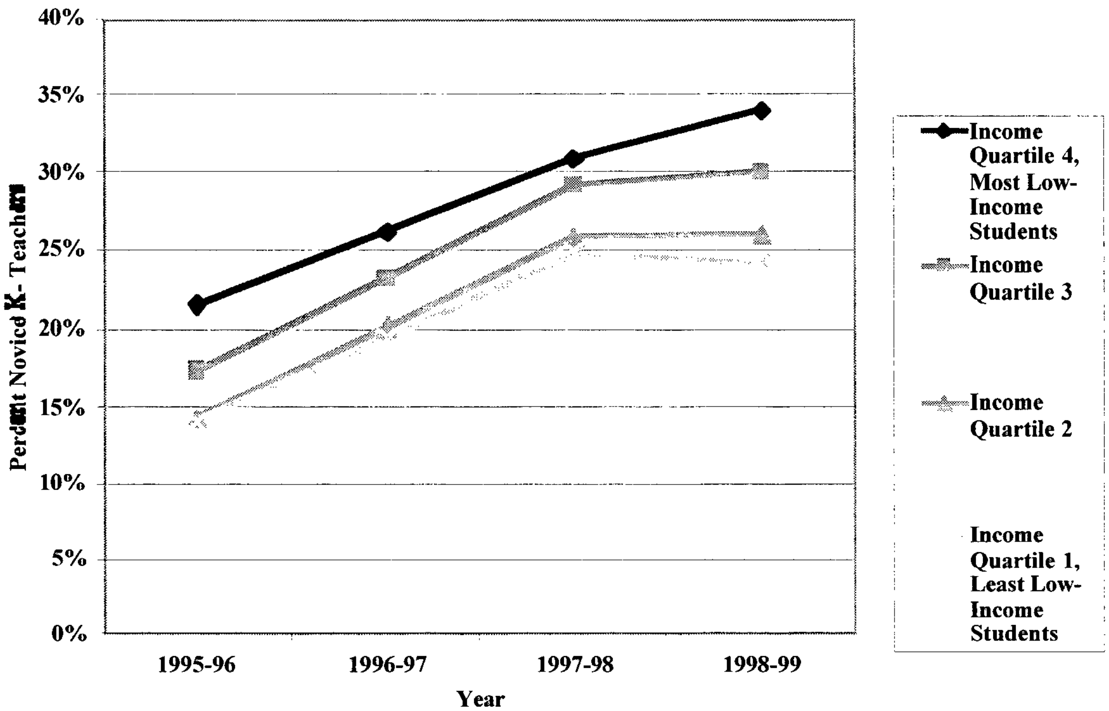
**FIGURE 5.5 PERCENTAGE OF K–3 TEACHERS WITH ONLY A BACHELOR'S DEGREE IN SCHOOLS WITH DIFFERENT PROPORTIONS OF POOR STUDENTS**




Source: CBEDS-PAIF.

Figure 5.6 shows the proportion of novice teachers in schools with different proportions of low-income students. During the first two years of CSR, this indicator of teacher qualifications behaved slightly differently than the other indicators did: The gap in teacher experience between schools with the largest and smallest proportions of low-income students actually shrank slightly, dropping from 7 to 6 percentage points. This trend was reversed in 1998–99, however, with the gap increasing to 10 percentage points.

### FIGURE 5.6 PERCENTAGE OF K–3 NOVICE TEACHERS IN SCHOOLS WITH DIFFERENT PROPORTIONS OF LOW-INCOME STUDENTS




Note: The 1996–97 percentage of novices is an average of the values of adjacent years because there was an unusually large amount of missing experience data for that year.
Source: CBEDS-PAIF.

In the final year reported, the proportion of novices remained flat, at about 24 percent, in schools with relatively small proportions of low-income students. But in schools with a larger share of low-income students, the proportion of novices grew from 31 to 34 percent.

To summarize, across all three of the indicators, similar patterns of change in the K–3 teacher qualifications emerged:

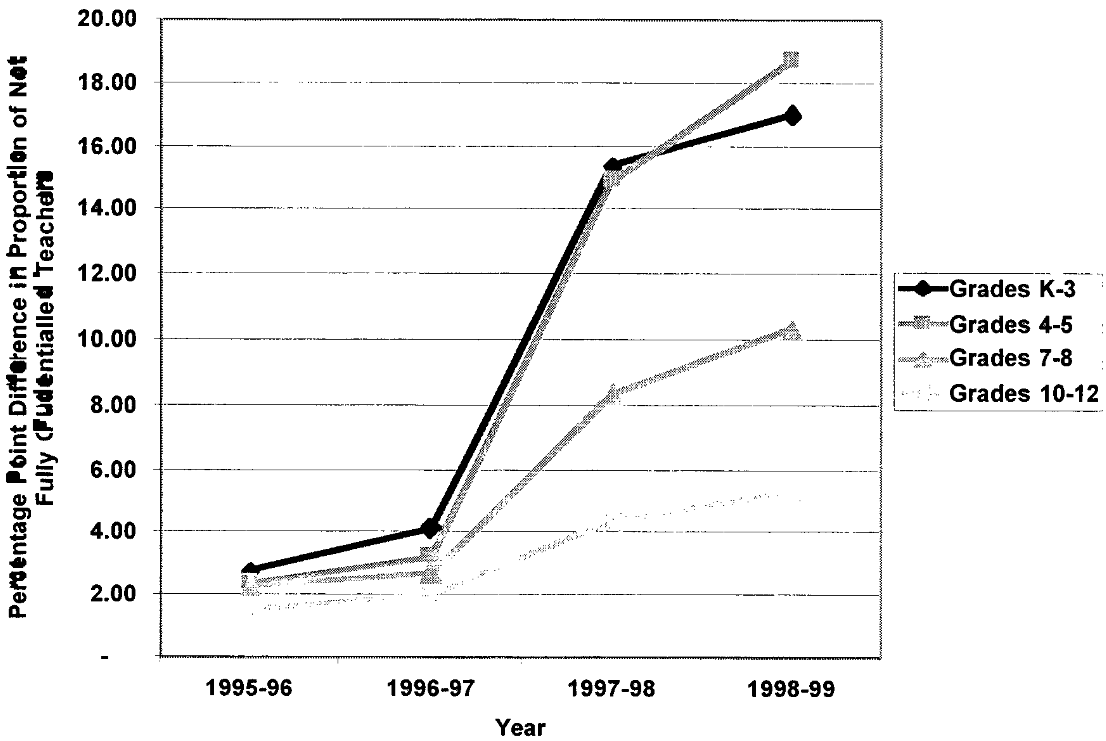
- There was a rapid California-wide decrease in K–3 teacher qualification levels in the first and second year of CSR that slowed in the third year.
- The decline was least in schools with small proportions of low-income (as well as minority, Hispanic or ELL) students. Moreover, this decline slowed and in some cases stopped in the most recent year of CSR.
- The decline was the greatest in schools with large proportions of low-income (as well as minority, Hispanic or ELL) students.

## Distributional Changes in All Grades

To place the distributional changes in K–3 in context, the gap in teacher qualifications between schools with the largest and smallest proportions of low-income students for all four grade groupings (K–3, 4 and 5, 7 and 8, and 10–12) is examined next. The difference between teachers in the top and bottom quartiles (schools with more than 30 percent low-income students and schools with less than 7.5 percent low-income students, respectively, in 1996–97) are shown, leaving out the middle two quartiles. Details on the distribution of teachers at the junior high and high school levels (grades 7 and 8 and 10–12) by percent low-income and percent minority can be found in Appendix 9.

Figure 5.7 shows the difference in the proportion of not fully credentialed teachers between schools with the highest and lowest proportions of low-income students. The gap in K–3 teacher credentialing that was discussed earlier is shown here. For example, in 1998–99, the difference in K–3 teacher credentialing between schools that served the smallest and largest proportions of low-income students was 17 percentage points.

FIGURE 5.7 GAP IN THE PERCENTAGE OF NOT FULLY CREDENTIALED TEACHERS BETWEEN SCHOOLS WITH THE HIGHEST AND LOWEST PROPORTIONS OF LOW-INCOME STUDENTS

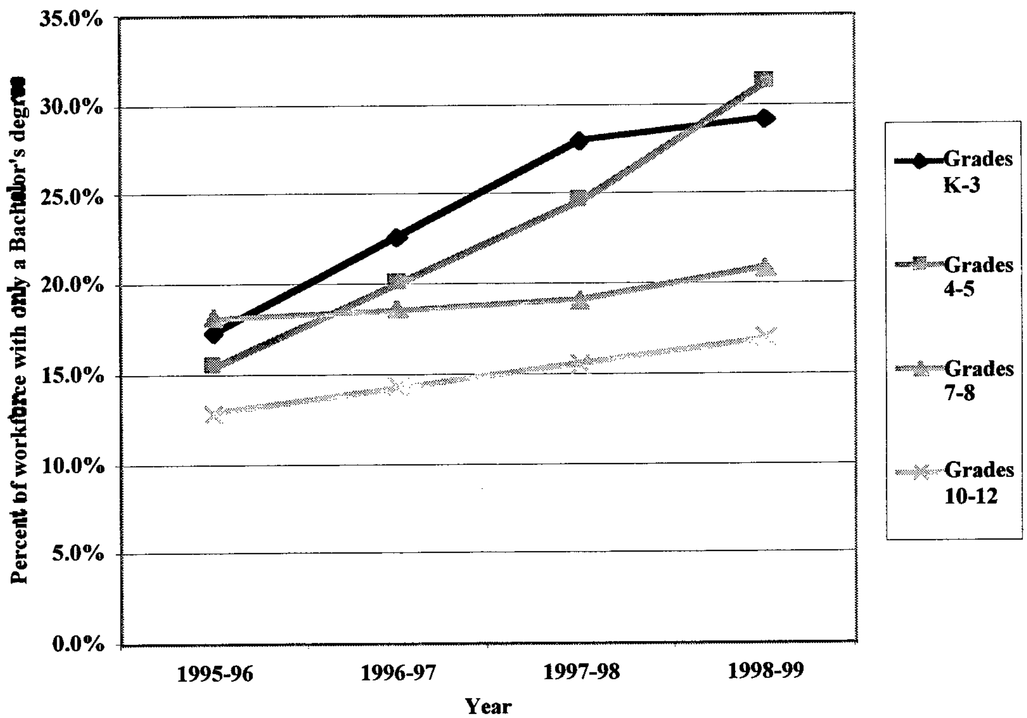



Source: CBEDS-PAIF

The gap between schools in the top tier and schools in the bottom tier existed for all four grade groupings in 1995–96 and grew for all four over the next three school years. These gaps were all similar in 1995–96, at around 2 percentage points: less than 1 percent of teachers in schools with the smallest percentage of low-income students were not fully credentialed, compared to between 2 and 3 percent of teachers in schools with the largest proportion of low-income students. Between 1995–96 and 1998–99, these gaps grew for all grade groupings, but the largest growth was in the elementary grades, K–3 and 4 and 5.

Figure 5.8 shows the difference in the proportion of teachers with only a bachelor's degree. The pattern here is similar to the one just discussed in that the gap grows more in the elementary grades than in the other grades. The gap between schools with the highest and lowest proportions of low-income students increased from 15 to 21 percent for teachers in K–3 and from 13 to 22 percent for teachers in grades 4 and 5. The gap in the proportion of teachers with only a bachelor's degree also grew for the other grade groupings. The smallest growth, from 10 to about 13 percentage points, was for grades 7 and 8.

**FIGURE 5.8 GAP IN THE PERCENTAGE OF TEACHERS WITH ONLY A BACHELOR'S DEGREE BETWEEN SCHOOLS WITH THE LARGEST AND SMALLEST PROPORTION OF LOW-INCOME STUDENTS**

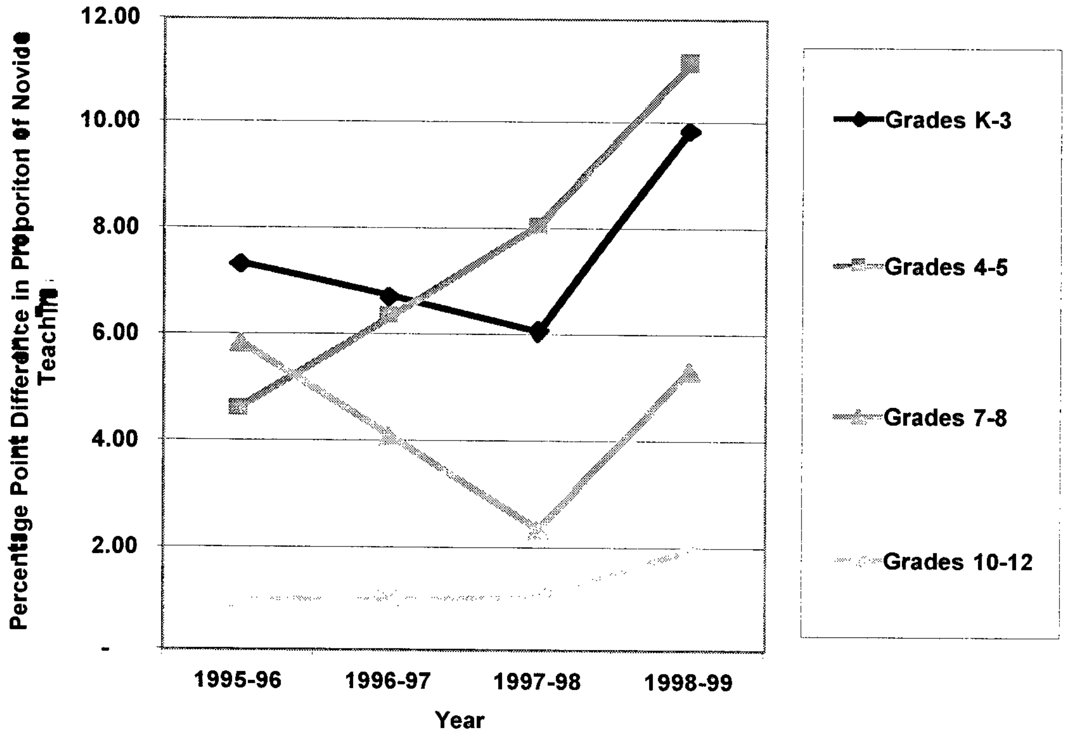



Source: CBEDS-PAIF.

The trend in the distribution of teachers with only a bachelor's degree in grades 10–12 was relatively convoluted. (Appendix 9 contains details.) The end result is that the gap between schools with the smallest and largest proportion of low-income students grew by roughly 3 to 4 percentage points between 1995–96 and 1996–97.

Trends in the proportion of novice teachers in schools with the largest and smallest proportions of low-income students are complex, as is shown in Figure 5.9. Recall that the proportion of novice teachers grew for all grade levels between 1995–96 and 1998–99 (see Figure 5.3). However, the difference in the proportion of novices between schools with the highest and lowest proportions of low-income students traced a less linear path. Only in grades 4 and 5 did the gap increase each year. The K–3 gap actually shrank between 1995–96 and 1997–98, as did the gap in grades 7 and 8. The gap for grades 10–12 remained about the same.

**FIGURE 5.9 GAP IN THE PERCENTAGE OF NOVICE TEACHERS IN SCHOOLS WITH THE HIGHEST AND LOWEST PROPORTIONS OF LOW-INCOME STUDENTS**




Note: Values for 1996–97 are averages of values for adjacent years because numerous experience data were missing in that year.
Source: CBEDS-PAIF.

In summary, across all three measures of teacher qualifications, the disparity between schools serving the largest and smallest proportions of low-income students increased for K–5 during the implementation of CSR. For novice K–3 teachers, this increase was completely the result of changes in 1998–99. For the other two measures—not fully credentialed teachers and teachers with only a bachelor's degree—the increase in the gap was constant over the three years of CSR implementation. The trends in changes were smaller for teachers in grades 7 and 8 and 10–12, and trends in the distribution of novice teachers for these two grade groupings were not clear. The next section provides some insight into the mechanisms that caused these changes.

## SECTION 2: CHANGE MECHANISMS

A key issue to understand is the movements, or flows, of teachers that caused the disparity in K–3 teacher qualifications to grow between schools with different populations of students. This understanding can help policymakers craft more direct responses to these issues. It is highly likely that several different patterns of movement contributed to the disparities found in teacher qualifications.

Some insight can be gained from analysis of novice teachers (i.e. those in their first three years of teaching). Table 5.3 shows the relative increases in novices in elementary schools between 1995–96 and 1998–99 by school proportion of low-income students. The column entries are percentage point changes in the proportion of novice teachers for K–3 and for grades 4 and 5 between 1995–96 and 1998–99. The base proportions can be found in Appendix 9.

**TABLE 5.3 CHANGES IN PROPORTION OF NOVICE TEACHERS IN SCHOOLS WITH DIFFERENT PROPORTIONS OF LOW-INCOME STUDENTS BETWEEN 1995–96 AND 1998–99**

| | Change in Proportion of Novice Teachers 1995–96 to 1998–99 | |
|---|---|---|
| **Schools** | **K–3** | **Grades 4–5** |
| **Schools with 7.49% or fewer low-income students** | 9.9 | 11.5 |
| **Schools with 7.5% to 17.49% low-income students** | 11.7 | 14.8 |
| **Schools with 17.5% to 29.9% low-income students** | 12.7 | 17.7 |
| **Schools with more than 29.9% low-income students** | 12.5 | 17.4 |

Source: CBEDS-PAIF.

In 1998–99, schools with the highest proportion of low-income students had the highest proportion of novices, as they had in the earlier years of CSR implementation. This indicates that schools serving the fewest low-income students were able to fill a larger proportion of their K–3 classes with experienced teachers. They were able to do this

both by hiring experienced teachers and by virtue of the fact that some of their teachers moved from the novice category to the experienced category.

At the same time, however, grades 4 and 5 increasingly relied on novice teachers to fill their classrooms in spite of the fact that there was little overall growth in the grade 4 and 5 teacher workforce. The increase in the proportion of novice teachers may indicate that experienced grade 4 and 5 teachers were moving to grades K–3. However, this does not constitute proof of the hypothesis. The increase in less-experienced teachers could reflect normal teacher attrition at a time when there were few experienced teachers to hire. Or attrition rates for grade 4 and 5 teachers might have increased because these teachers were increasingly leaving for other occupations, or for grades other than K–3.[46] Evidence presented in the next part of this chapter shows a large source of K–3 teachers were teachers who moved down from higher grades during the first year of CSR implementation,.

[46] The gross number of teacher retirements over the period examined does not support the hypothesis that there were increased grade 4 and 5 teacher retirements between 1996–97 and 1998–99. Personal correspondence with the State Teachers Retirement System revealed that the overall number of teacher retirements (for all grades) declined slightly in 1996 and 1997 and then increased in 1998 and 1999. The average number of retirements per year between 1992 and 1999 was 7,332, with differences between the years of no more than 1,000 retirements, or 14 percent. The number of retirements by year was as follows: 7,479 in 1992, 8,064 in 1993, 7,088 in 1994, 7,188 in 1995, 6,699 in 1996, 6,324 in 1997, 7,691 in 1998, and 8,123 in 1999.

**TABLE 5.4 CHARACTERISTICS OF 1998–99 NOVICE TEACHERS IN SCHOOLS WITH DIFFERENT PROPORTIONS OF LOW-INCOME STUDENTS**

| | K–3 | | Grades 4–5 | |
|---|---|---|---|---|
| Schools | Percent Bachelor's Degree Only | Percent Not Fully Credentialed | Percent Bachelor's Degree Only | Percent Not Fully Credentialed |
| Schools with 7.49% or fewer low-income students | 30% | 15% | 32% | 16% |
| Schools with 7.5% to 17.49% low-income students | 42% | 28% | 43% | 32% |
| Schools with 17.5% to 29.9% low-income students | 53% | 43% | 54% | 46% |
| Schools with more than 29.9% low-income students | 62% | 51% | 63% | 55% |

Source: CBEDS-PAIF.

Table 5.4 shows the relative qualification levels in terms of education and credentialing for novice teachers in 1998–99 for both K–3 and grades 4 and 5. There are two key points to note. First, the novice qualification levels for K–3 and grades 4 and 5 were very similar across income quartiles. For example, for schools serving the largest proportion of low-income students, 62 percent of novice K–3 teachers were not fully credentialed, compared with 63 percent of novice grade 4 and 5 teachers.

Second, novice teachers in schools with more low-income students were not as well qualified as novice teachers in schools with fewer low-income students. This difference in the qualification levels of the newer teachers appeared to be a key factor driving the increasing gaps in the overall teacher credentialing and education levels between 1995–96 and 1997–98. But between 1997–98 and 1998–99, this difference in novice qualification levels was not the only factor driving what were further increases in this gap. During this period, schools that served higher proportions of low-income students not only had less-qualified novices as teachers, but as shown in Table 5.3, larger increases in their proportion of novices.

## Modeling the Flow of K–3 Teachers

It is important to separate the economic from other forces driving the increased disparity in teacher qualifications. One way to approach this problem is by monitoring the flow of teachers in, between, and out of schools. There is limited data available that allows the tracking of California teachers across years. This analysis takes advantage of data that is available for 1995–96 and 1996–97, the year prior to CSR and the first year of CSR implementation, that allows tracking of teachers between years. Additional data are not available during later years due to policy changes at the California Department of Education. This analysis is based on a subset of districts that provided reliable data. The analysis in this section is limited to K–3 teachers and focuses on teacher credentialing and education levels while controlling for teacher experience. These two measures are chosen for further analysis since they showed the largest differential between schools with different populations during the first year of CSR, i.e., the only year the data are available. Understanding the effect of CSR on K–3 teachers is a first priority since K–3 is the focus of the policy.

This analysis is broken into three parts. The first part describes a model of the flow of teachers into and between schools, and out of districts. This part goes on to describe the base flows of teachers in the sample. The second part describes the relationship between students' race, particularly the proportion of black students in a school, and the flow of teachers out of K–3 classrooms in 1995–96. The third part describes the new K–3 teachers and the relationships between student characteristics and the teachers that flow into these positions.

## Data Used for the Analysis of Teacher Movements

The CCD is the source of data on school and district enrollments and counts of the number of schools for the analysis of teacher movements. The data used here was downloaded from the web during the fall of 1999.

Data on the minimum and maximum teacher salary for each district is taken from California J-90 "Salary and Benefits Schedule for the Certificated Bargaining Unit." This voluntary survey was issued in May 1996 and was completed by over 80% of school districts. Data on the district expenditures is taken from the J-200 "Annual Survey of District Revenues and Expenditures."[47] Data on county-level conditions were produced by the California Department of Finance (CA DoF, population density), the Employment Development Department (CA EDD, unemployment rate), and the Bureau of Labor Statistics (BLS, wages, per capita income).

For the analysis of transitions, responses on the PAIF in one year had to be linked with the responses for the following year. Teacher identification numbers (usually a Social

[47] Both of these data sets are public and can be downloaded from ftp://ftp.cde.ca.gov/.

Security number) provided on the PAIF were used to follow individuals across years. Only PAIF files from the years 1992 through 1996 are available with identification numbers. A key issue for this analysis was creating a sample of districts that provided reliable identification codes on the PAIF. Some districts (and individuals) use their own coding system instead of the Social Security number, and others do not provide identification codes. The identification codes on the released PAIF files were scrambled to protect individuals' identity.

The analysis was done on a sample of districts that were selected because they provided reliable information for linking teachers across years. Districts were dropped from the sample based on four indicators of unreliable identification numbers. When a certain proportion of PAIF respondents met any one of these indicators, for any of the years 1992–1996, then that district was dropped from the sample for all years being examined. The indicators and thresholds for cutting a district out are:

- lack of identification number, (5%)
- duplicate identification numbers within a given year (10%)
- very low rate of linking between years, i.e., less than 70% of respondents in any one year can be linked with respondents in the next year
- a high rate of false links (5%). (False links are links where the identification codes are the same, but the individual's sex, race or age does not remain the same indicating a "false" link.)

The final sample of districts was made up of about 738 of the roughly 1,058 districts. The majority of school districts that were dropped were relatively small. The decision rules for excluding unreliable districts are biased against small districts because only one or two respondents with a mistake in completing the PAIF could cause the district to be excluded. Some rather large districts, including Los Angeles Unified School District (LAUSD), were also excluded.

The districts in the sample resemble districts in the state when LAUSD is excluded. Table 5.5 below shows the characteristics of school districts in the state, the state not including LAUSD, the sample and LAUSD alone in 1995. Schools in the sample have a slightly higher percentage of white students and a slightly lower percentage of students eligible for free and reduced lunch than the state without LAUSD. The characteristics of LAUSD are different from the average state district. It is much larger and has many more Hispanic students, as well as students eligible for free and reduced lunch.

**TABLE 5.5 DISTRICT CHARACTERISTICS IN 1995** (Totals May Not Sum Exactly Due To Rounding)

| | State | State without LAUSD | Sample | LAUSD |
|---|---|---|---|---|
| **Total Students** | 5,468,000 | 4,821,000 | 3,824,000 | 648,000 |
| **Percent White** | 40 | 44% | 45% | 12% |
| **Percent Black** | 9 | 8 | 8 | 14 |
| **Percent Hispanic** | 39 | 35 | 35 | 66 |
| **Percent Asian** | 11 | 12 | 11 | 7 |
| **Percent American Indian** | 1 | 1 | 1 | 0 |
| **Percent Free and Reduced Lunch Eligible** | 46 | 43 | 41 | 70 |

Source: PAIF

## Methodology for Tracking the Flow of Teachers During the First Year of CSR

The goal model used to measure the relationship between school-level student characteristics and transitions in and out of schools is to control for factors identified in the literature as related to teacher attrition. Traditionally these models are used to explain teacher behavior at the district or even state level. This model attempts to describe teacher behavior at the school level. The model structure is very similar to one employed by Theobald (1990) except that teacher moment is examined at the school level. While this model is similar to many econometric models of teacher behavior, the results here are used to describe teacher movements and do not attempt to describe the motivation that caused teacher behavior.

The model used here attempts to control for many factors that influence a teacher's movements in an effort to tease out some school-level characteristics that influence a teacher's decision. As with many other models of teacher behavior, the data does not allow for discerning whether a teacher moves in or out of a school based on his/her own choices or choices made by the district. In other words the data does not differentiate teacher quits from teacher layoffs, voluntary teacher transfers or school placements, and district enforced transfers or school placements. Layoffs are not expected to be the source of many school separations since this was a period of overall growth in student enrollment. The inability to differentiate between district and teacher choices for placement does not conflict with the goal of the modeling, which is to observe the correlation of school characteristics with teacher mobility.

The sample is essentially a cross-section model of decisions during a single period. As such, it suffers from both right and left censoring in that it cannot capture all of the time-dependent dimensions of the decisions being modeled.

Table 5.6 below summarizes the variables used in the model. Since the model implicitly assumes teachers are similar at the school level, the White-Huber correction of the standard error for clustering at the school level is used.

**TABLE 5.6 VARIABLES USED TO MODEL TEACHER MOBILITY**

| Control | Variable(s) Used |
|---|---|
| **Alternative Opportunities** | County unemployment rate |
| | Average all industry wage |
| | Population density |
| **District-Level Conditions/ Opportunities** | Number of schools (also cubed) |
| | Number of students (also cubed) |
| | Instructional spending per pupil |
| | Administrative spending per pupil |
| | Maximum salary available for a teacher (Minimum salary in salary schedule was used in the new teacher model) |
| **School-Level Conditions** | Students race in percentage of total (black, white, Hispanic, Asian and American Indian, white is the reference variable) |
| **(in leaving and entering school for transfers)** | Interaction of CSR with student's race (with white and reduction as the reference variable) |
| | Student poverty (measured as percent eligible for free lunch) |
| | Number of students (also cubed) |
| | Class size |
| | Urbanicity (rural and urban-referencing suburban) |
| | Implementation of CSR in the teacher's grade |
| **Teacher-Level Characteristics** | Age (and cubed and squared) |
| | Gender |
| | Total years of experience (and cubed) |
| | Education (between a BA and MA is reference to those with only a BA and those with more than a BA) |
| | Credential status (in transfer and quit decisions) |
| | Race (black, white, Hispanic, Asian and American Indian, white is the reference variable) |

The CSR implementation variable was derived by the California CSR evaluation team from teachers' reported class size using the 65% rule. If over 65% of the teachers in a grade report teaching in classes under 20, then it is assumed all classrooms in that grade are reduced. This approach is reasonable given reports by district officials of their reluctance to not reduce all classrooms in a grade (Bohrnstedt & Stecher, 1999).

## Basic Flows of Teachers In and Out of Schools

The data available allow the description of the basic decisions about whether and where to work over a two-year period. The decisions are described in the following order. The first is whether to teach or not to teach in the current district during the following year. If the teacher continues to teach in the district, does s/he stay in the same school or move to another school? If s/he stays in the school, does s/he change grades?

These decisions are not made solely by the teacher, but can, and surely are, made for teachers by school and/or district officials. The movements that are revealed in the data are a function of teacher, school official and district official preferences. Thus these models describe teacher movements, but can not clearly isolate all the elements that motivate these changes.

**FIGURE 5.10 BASIC MODEL OF TEACHER FLOWS (SOLID LINES SHOW MOVEMENTS THAT CREATE VACANCIES)**

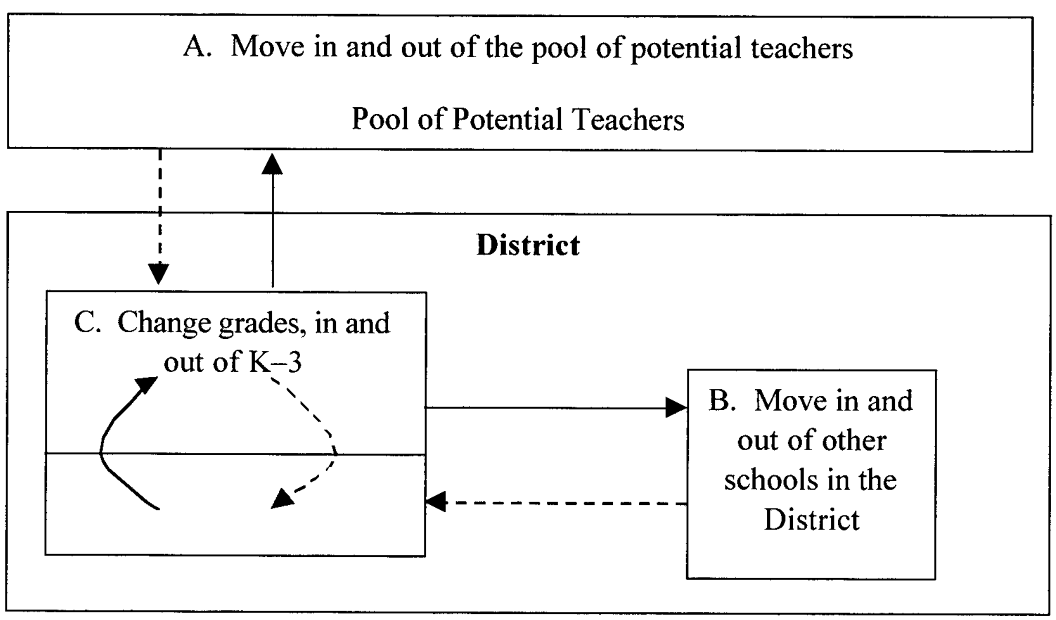


Figure 5.10 schematically shows these movements. The movements that create vacancies in K–3 are shown with a solid line; the moves that fill vacancies are shown with a dashed line. There are basically three flows of teachers shown. The first flow (A) is in and out of a district. The second (B) is the flow of teachers between schools within a district. This flow of teachers includes teachers who change schools and grades at the same time. The third flow (C) is between grades within a school.

Table 5.7 shows the relative flows of teachers who were teaching K–3 in 1995 in the linked sample. The total number of teachers is about 27,000 less than the total number of K–3 teachers because some districts were excluded due to provision of unreliable ID numbers for linking between years.

**TABLE 5.7 FLOW OF K–3 TEACHERS AFTER 1995–96**

| Teacher's Action | Number | Percent |
|---|---|---|
| **A.1 Stay in K–3 in the same school** | 35,063 | 79.8% |
| **A.2 Leave the district** | 4,195 | 9.5% |
| **B. Move to other schools in the district** | 1,910 | 4.4% |
| **C. Change to a higher grade in the same school** | 2,772 | 6.3% |
| **Totals** | 43,940 | 100% |

Source: PAIF

Note that the percentage is also the base probability action that teacher will take any of the four different actions. In other words about 80% of the teachers who were teaching K–3 in 1995 were also in K–3 in 1996, and 80% can also be thought of as the probability that a teacher will remain in K–3 between 1995–96 and 1996–97. The model shown later will estimate the changes in these probabilities based on characteristics of students in the school.

**TABLE 5.8 FLOW OF K–3 TEACHERS INTO K–3 IN 1996–97**

| Source of Teacher | Number | Percent |
|---|---|---|
| **A.1 Stay in K–3** | 35,063 | 67.2% |
| **A.2 New to the district** | 11,554 | 22.2% |
| **B. Move from other schools in the district** | 2,065 | 4.0% |
| **C. Change from a higher grade in the same school** | 3,471 | 6.6% |
| **Totals** | 52,153 | 100% |

Source: PAIF

Table 5.8 shows the flow of teachers into K–3 in 1996–97. There are several interesting points. First, note the net increase of about 18% in the number of K–3 teachers, mostly due to CSR. The average K–3 class size, in this sample, was 29.1 in 1995–96 and 24.9 in 1996–97. A quick algebraic calculation shows that roughly 92% of this increase is due to CSR.[48].

Second, note the difference in the total number of teachers (2,772) who stayed in the same school but moved out of K–3, while 3,471 teachers who had moved into K–3 in 1996 were from other (higher) grades. Thus there was a net gain in the number of teachers changing grades within schools, i.e., 25% more teachers changed into K–3 than out of K–3.

There was also a very small net gain of teachers who changed schools within the district. This net gain means more teachers who changed schools also moved into K–3 than teachers who changed schools and moved out of K–3. Between those who changed out of higher grades to K–3 within a school and those who changed to K–3 while transferring schools within a district, there was a small increase in the number of K–3 teachers. This difference represents a small proportion of the total number of K–3 teachers in 1996–97 (1.6%) and a larger proportion (10.4%) of the net increase in K–3 teachers.[49]

Despite the internal movement, the main source of new teachers, in this sample, for K–3 during the first year of CSR was from outside the district. As is shown in Table 5.8, 22.2% of all K–3 teachers were new to their district in 1996–97. This was a net gain of about 7,400 teachers, which was just under 90% of the net increase in the number of teachers.

The next issue is the qualifications of the teachers coming from these four sources outlined above. Table 5.9 shows the proportion of fully credentialed teachers and bachelor's degree only teachers for the entire sample and for each of the four sources.

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[48] An average class size of 24.9 indicates the 52,147 1996–97 teachers taught about 1.298 million students (52,147*24.9). To maintain a class size of 29.1 would require about 44,600 teachers (1,298,000/29.1). The difference between 44,600 and 52,147 of about 7,500 is an estimate of the growth due to CSR.

[49] As a side note related to part 1 of this chapter, there were 16,526 grade 4–5 teachers in the linked sample in 1995–96. Of these, 8.8% left their districts, 5.0% changed schools within their district, 69.7% stayed in the same school and grade, and 16.5% changed grades within the same school. There were 16,682 grade 4–5 teachers in the sample in 1996–97. Of these, 14% were new to the district, 3.8% were new to their schools but not the district, 69% had remained in the same school and grade, and 13% had changed grades within the same school. Between 1995–96 and 1997, there was a net loss of 4.3% of the teachers who remained in the same district, but moved to different grades. Of those who left grades 4–5, 88.5 % went to K–3. In other words, 3.9% of the grade 4–5 teachers in 1995–96 moved to K–3 classrooms, within the same district, in 1996–97.

**TABLE 5.9 QUALIFICATIONS OF 1996–97 K–3 TEACHERS BY SOURCE**

| Source of Teacher | Percent Not Fully Credentialed [a] | Proportion of All Not Fully Credentialed Teaches in 1996–97 | Percent with a Bachelor's Degree Only[a] | Proportion of All Bachelor's Degree Only Teachers in 1996–97 |
|---|---|---|---|---|
| **A.1 Stay in K–3[50]** | 1% | 16% | 9% | 41% |
| **A.2 New to the district** | 17 | 80 | 33 | 52 |
| **B. Move from other schools in the district** | 2 | 2 | 9 | 3 |
| **C. Change from a higher grade** | 1 | 2 | 10 | 4 |
| **Totals** | 4.5% | 100% | 13.9% | 100% |

Source: CBEDS-PAIF

a: Using pair-wise comparisons, qualifications of teachers who are new to the districts are statistically different from the other groups at the .01 level. All other groups are not statistically different from each other at the .05 level.

The second column of Table 5.9 shows the percent of teachers, by sources, who were not fully credentialed. The third column shows what percent of the total number of not fully credentialed teachers this represents. For example, 1% of teachers who stayed in K–3 in the same school were not fully credentialed. Since the main source of K–3 teachers in 1996–97 was teachers who stayed in the same grade range and school, this 1% adds up to 16% of all not fully credentialed K–3 teachers. The main source of not fully credentialed teachers was the new teachers to the school and district. Seventeen percent of the new teachers were not fully credentialed and these not fully credentialed new teachers comprised 80% of all not fully credentialed teachers.

The fourth and fifth columns show the same information for the teachers with a bachelor's degree only. As with teacher credentialing, new teachers were the group with the largest proportion of the bachelor's degree only teachers, as well as the source of most of the bachelor's degree only teachers.

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[50] The proportion of teachers who stayed in K–3 between 1995–96 and 1996–97 and who became credentialed was very small; 1.2% of this group were not fully credentialed in 1995–96 compared to 1.1% in 1996–97. These proportions are significantly different at the .01 level.

Finally note that the 4.5 percent of this sample that were not fully credentialed is slightly higher than the proportion in the entire sample, which was 4.0%. The 13.9%.proportion of bachelor's degree only teachers is much smaller than the statewide proportion, which was 22.7%. This large difference may be due to a large number of bachelor's degree only teachers in LAUSD, which is not included in the sample.

## School-Level Factors Associated with the Flow of Teachers Out of K–3

This portion describes the relationship between certain student characteristics and the propensity for K–3 teachers to leave schools during the first year of CSR. The goal of this portion is to describe the relationship between teachers creating vacancies in K–3 by leaving and student characteristics and the implementation of CSR. Three logistic models are used to isolate the effect of school-level characteristics on the propensity for K–3 teachers to move out of the district, to another school, and to a higher grade. The complete model results, along with the mean values for each of the variables used in the model, can be found in Appendix 10.

The first half of this chapter showed that there was a differential effect of the changes in teacher qualifications relative to student characteristics. The output from the model is used to simulate the effect of a 10 percentage point increase in four key school measures: percent of the student body that is black, Hispanic, Asian and eligible for free and reduced lunch.[51] The first part of this portion shows the relationship between student characteristics and teacher movement out of the district.

A key issue is when a teacher makes the decision to move. Recall that CSR in California was implemented quickly during the summer of 1995. Teachers who decided to leave a school during or soon after the 1994–95 school year would have little knowledge about the future effect of CSR on their working conditions. For that reason, CSR implementation is not expected to have an effect on a teacher's decision to leave the district, and reduction of a teacher's grade is not included in the model of the teacher's behavior.[52]

It is possible that CSR implementation may have a greater effect on a teacher's decision to change grades or schools. If these decisions were made during the summer while schools where preparing to implement CSR, then teachers and schools could use this information in making decisions about where teachers will work. For that reason implementation of CSR in the teacher's grade is modeled, and the results are shown for these two decisions.

[51] Changes in the proportions of American Indian students were also included in the regression but are not reported here since none were significant at the .05 level.

[52] An exploratory model of the quit decision was run with reduction of the teacher's grade the following year as an independent variable; the coefficient on this variable was not significant.

These decisions have been shown in the literature to be affected by multiple factors that can be seen through at least two different theoretical perspectives. The human capital theory assumes that the decision to remain in teaching is a function of the investments a teacher has made in herself and the utility she derives from those investments in a given occupation. The amount of investment and its return changes during a person's lifetime. A person with a large investment in the education profession, i.e., graduate degrees in education has a larger investment in education than a person with a smaller investment in teaching. Similarly a person who has a new family may earn higher utility return from staying at home with children than working at a school. These theories have shown that factors such as education level, experience, sex, opportunities within a district, and opportunities outside of a district have significant impact on choices about remaining in teaching (Greenberg & McCall, 1974, Murname & Olsen, 1989, Rickman & Parker, 1990, Theobald, 1990, Kirby, Grissmer & Hudson, 1991, Brewer, 1996, Kirby, Naftel, Berends, 1999).

Opportunities outside of teaching have been shown to influence teachers' decisions to remain in teaching (Rumberger, 1987, Murname & Olsen, 1989, Murname, Singer & Willett, 1989, Rickman & Parker, 1990, Theobald, 1990). These authors generally found that better opportunities for work outside of school reduced district access to qualified teachers and increased attrition. These opportunities are controlled with county unemployment rates, average all industry wages and population density. The population density is intended to control for relatively higher access to other jobs in areas with higher population densities compared to less access in areas with lower population densities.

District-level factors, such as salary, opportunities within the district, and district expenditures on teaching, are identified as important in teacher quit decisions. Generally, higher salaries attract more teachers than more opportunities within the district, and higher spending on teaching increases the probability of teachers remaining in a district. Lowest teacher salary in a district is used to control for salary effects in the new teacher analysis and maximum salary in the teacher retention analysis. Opportunities within the district are controlled for using administrative expenditures per pupil, growth in enrollment, number of schools, and district enrollment (cubed terms are used to control for non-linear relationships for number of schools and district enrollment) (Greenberg & McCall, 1974, Rumberger, 1987 Murname & Olsen, 1989, Murname, Singer & Willett, 1989, Rickman & Parker, 1990, , Theobald, 1990, Brewer, 1995, Kirby, Naftel, Berends, 1999).

The relationship between teachers' personal characteristics, age, race and education, have been modeled extensively. Kirby's research has focused on lifecycle factors, age, sex and race and how they affect individuals' career trajectories (Kirby, Grissmer & Hudson, 1991, Kirby, Naftel & Berends, 1999). These issues are controlled for using indicators of teacher race (black, Hispanic, Asian, American Indian or white), age (squared and cubed to control for non-linear relationships), and education (bachelor's degree, between a bachelor's degree and master's, and master's or higher). A key issue identified by Kirby

and her associates is the "U" shaped pattern of attrition, with high attrition among younger and older teachers. Kirby theorized that the attrition among older teachers is due to retirements, which is expected to be done for personal reasons not related to school characteristics. For that reason the attrition model is run twice, once on all teachers and again on teachers under the age of 55.

There has been considerably less modeling of the school-level conditions and teacher movement with the exception of class size as a workload indicator. Some exceptions are Greenberg and McCall (1974) and Mont and Rees (1991). Greenberg and McCall found that teachers in San Diego transfer from low student socio-economic status (SES) schools to higher SES schools. Mont and Rees found larger class sizes increase the probability of teachers quitting a district.

A second approach is related more to personal characteristics of the teachers (skills, abilities, and values). Chapman bases his work in social learning theory. Chapman posits that retention in teaching is a factor of six influences that include initial commitment to teaching, quality of the first teaching experience, and integration into teaching, which influence career satisfaction, which in turn influences the decision to remain in teaching (Chapman & Hutcheson, 1982, Chapman & Green, 1986) Other researchers have also been able to bring more personal factors, especially measures of skill and ability, into studies of teacher behavior, usually using some sort of economic framework (Manski, 1987, Murname, Singer & Willett, 1989, Shen, 1997). The data used in this study does provide for inclusion of these more personal measures.

Table 5.10 shows the selected results of the model and the results of a simulation of the changes in the probability that a teacher will leave the district using the model output. The format used here will be used for the remainder of the section. Each cell has two numbers. The top number is the output from the logistic regression converted to an odds-ratio, which is the anti-log of model coefficient. The odds-ratio under 1 indicates that the relationship is negative. The bottom number is the product simulation of the change in the propensity of a teacher moving based on that odds-ratio. A 10% change in student demographics in the teacher's school is used in the simulation. In all cases the percentage of white students is the reference variable. In other words, the proportion of white students decreased when the given group increased. Changes in class size are shown for an increase in class size of one. The second column shows the mean proportions of the different populations in the sample. The second row shows the base probability of a teacher leaving for each of the samples.

This model of teachers leaving the district is run twice, one for all 1995–96 K–3 teachers in the sample, and the second for teachers under 55 years old. The model of teachers under 55 was done to exclude teachers who leave a district for retirement. The results are presented as the change in the probability of leaving based on the change in student

characteristics and the odds-ratio. The change in probability is the results of a simulation using the odds-ratio.[53, 54]

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[53]For information on interpreting logistic regression output see Neter, Wasserman and Kutner (1989) or the Academic Technology Services at UCLA:
http://www.ats.ucla.edu/stat/stata/code/odds_ratio_logistic.htm.

[54] The odds-ratio is the change in the base odds from a 1 unit change in the independent variable. So the base odds of leaving are .0928= .094/(1+.094). The change in the odds of leaving from a 10% increase in the proportion of black students is 1.10=1.01^10. The new odds of leaving are .114=.094*1.1. The new probability of leaving is .103=.114/(1-.114). The change in probabilities is .09 =103-.094, as shown in the middle cell of the third row.

**TABLE 5.10 ODDS-RATIOS AND CHANGE IN PROBABILITY OF A K–3 TEACHER LEAVING A DISTRICT FROM CHANGES IN SCHOOL CONDITIONS**

| | Mean Proportion in Sample | C. Leave the District (All Teachers) | C. Leave the District (Teachers under 55) |
|---|---|---|---|
| **Base Probability** | | 9.4% | 8.5% |
| **Black Students (change in probability of leaving from 10 percentage point increase)** | 8% | 1.01 (.9 percentage points)** | 1.013 (1.1 percentage points)** |
| **Hispanic Students (change in probability of leaving from 10 percentage point increase)** | 37 | 1.004 (0.3)** | 1.004 (0.4)** |
| **Asian Students (change in probability of leaving from 10 percentage point increase)** | 10 | .9992 (-.1) | .9998 (0.0) |
| **Free Lunch Eligible Students (change in probability of leaving from 10 percentage point increase)** | 51 | .998 (-0.1) | .998 (-0.1) |
| **Teacher's Class size** | 29.1 students per teacher | .985 (-0.1)* | .983 (-0.1)* |
| **Model Pseudo R-squared** | | .0559 | .0645 |

**significant at the .1 level

*significant at the .05 level

Source: CBEDS PAIF, CCD, CA EDD, CA DoF, BLS

The simulation shows than an increase in the proportion of black or Hispanic students increases the probability that a teacher left a school by a small but statically significant amount. The average proportion of black students in schools in this sample was about 8%. The simulation shows that an increase of black students by 10 percentage points increases the probability that a teacher will leave a district by about 1 percentage point. Another way to interpret this is that schools with 18% black students had about 1% more vacancies than schools with 8% black students. The change in probability of leaving in schools with more Hispanic students is about half the change for black students.

Changes in the proportion of Asian or free lunch eligible students showed no statistically significant effect.

Surprisingly, class size shows a statistically significant negative relationship to teachers leaving a district. In other words, an increase in class size by one decreases the probability that a teacher will leave a district by .1 percentage points.

The second set of models looks at the propensity for teachers to transfer schools within a district. The results of this model are shown in Table 5.11. The sample used in the model is all K–3 teachers who remained in the same district between 1995–96 and 1996–97. This model only applies to teachers who remain in a district. Here CSR is expected to have an effect. These models are first for changes in student characteristics in the school that teachers have left, and then for schools where teachers have arrived. In other words, the model reported in the third column is of teachers who were in K–3 in 1995–96, and the model reported in the fourth column is of teachers who were in K–3 in 1996–97. The small differences in base probability of leaving compared to arriving are in line with the earlier discussion that more teachers moved into graded K–3 in 1996–97 than left in 1995–96.

**TABLE 5.11 ODDS-RATIO AND CHANGE IN THE PROBABILITY A K–3 TEACHER CHANGES SCHOOLS WITHIN A DISTRICT FROM CHANGES IN SCHOOL-LEVEL CONDITIONS**

| Characteristic | Mean Proportion in Sample | Change in the Base Probability of Leaving a School | Change in the Base Probability of Arriving to a School |
|---|---|---|---|
| **Base Probability** | | 4.4% | 4.5% |
| **Black Students (change in probability from 10 percentage point increase)** | 8% | 1.132<br>(9.5 percentage points)** | .888<br>(-3.1 percentage points)** |
| **Hispanic Students (change in probability from 10 percentage point increase)** | 38 | 1.079<br>(4.6)** | .924<br>(-0.3) |
| **Asian Students (change in probability from 10 percentage point increase)** | 10 | .985<br>(-0.6) | 1.00<br>(0.0) |
| **Free Lunch Eligible Students (change in probability from 10 percentage point increase)** | 51 | 1.02<br>(1.0)** | .984<br>(-.06) |

## TABLE 5.11 (CONT.) ODDS-RATIO AND CHANGE IN THE PROBABILITY A K–3 TEACHER CHANGES SCHOOLS WITHIN A DISTRICT FROM CHANGES IN SCHOOL-LEVEL CONDITIONS

| Characteristic | Mean Proportion in Sample | Change in the Base Probability of Leaving a School | Change in the Base Probability of Arriving to a School |
|---|---|---|---|
| **Base Probability** | | 4.4% | 4.5% |
| **Class Size** | 29.2 (25.9 for arriving) | .995 (0.0) | .981 (-0.1)* |
| **CSR in teacher's grade** | 34% | NA[55] | 1.31 (1.2)* |
| **Black Students & CSR (change in probability from 10 percentage point increase & CSR)** | 2 | NA | .985 (-0.6)** |
| **Hispanic Students & CSR (change in probability from 10 percentage point increase & CSR)** | 10 | NA | 1.00 (0.0) |
| **Asian Students & CSR (change in probability from 10 percentage point increase & CSR)** | 3 | NA | 1.006 (0.3) |
| **Free Lunch Eligible Students & CSR (change in probability from 10 percentage point increase & CSR)** | | NA | .997 (-0.1) |
| **Model Pseudo R-squared** | | .1472 | .1405 |

* significant at the .1 level

** significant at the .05 level

Source: CBEDS PAIF, CCD EDD, Department of Finance, BLS

NOTE: The simulated effects for the interaction effects only take into account the effect of the reported coefficient

[55] CSR in the teacher's grade was included in the model of teachers transferring out of schools but was not statistically significant, nor were any of the interaction terms.

The results reported in the third column show that increases in the proportion of black, Hispanic and free lunch eligible students increase the probability that a teacher will leave. The largest effect is changes in the proportion of black students, where a 10 percentage point increase in black students is associated with a 9.5 percentage point increase in the probability that a teacher will transfer out of a school. In other words the probability that a teacher will transfer out goes from 4.5% to 13.9% when the proportion of black students increases from 8% to 18%. The change in the probability of transferring associated with a 10% increase in Hispanic or free lunch eligible students was 4.6 and 1 percentage points respectively.

The odds-ratio for the class size variable, while not significant, is again not in the expected direction. An increase in class size decreased the probability that a teacher left a school. This may reflect the fact that changing schools is a decision that was influenced by both the teacher's and the school district's preferences. So while a teacher may have wanted to leave a school with large class sizes, school districts may have discouraged the move.

The fourth column shows that increases in the proportion of black students in the arriving school decreased the probability that a teacher will move to that school. The probability that a teacher moved into a school decreased from 4.5% to 1.1% when the proportion of black students increased from 8% to 18%. The odds-ratios were not significant for changes in the other student characteristics.

The evidence so far shows that schools with higher proportions of black, Hispanic and free lunch eligible students were more likely to have teachers leave the schools for other schools within the district and schools with higher proportions of black students were less likely to have teachers transfer in. Remember as shown in Table 5.9, teachers who transferred were overwhelmingly credentialed. So schools with more black students not only saw a net loss in the number of teachers, they also saw a net loss in the number of credentialed teachers.

The bottom half of the fourth column models the effects of CSR and its interaction with student characteristics. Not surprisingly, larger class sizes decrease the probability that a teacher will transfer into a school by a small amount, which was statistically significant at the .1 level. Second, implementation of CSR in the arriving teacher's school and grade increases the probability that a teacher will transfer into a school.

The interaction of CSR with student characteristics has little effect on the probability that a teacher will transfer to a school. All of the odds-ratios, except the interaction with percentage of black students, are not statistically significant. This odds-ratio is less than one, indicating that even with CSR teachers are less likely to transfer into a school with more black students.

The final model shows the probability of teachers moving in and out of K–3. The dependent issue was if the teacher changed grades, and the sample was all K–3 teachers who remained in the same school in 1995–96 (second column) and in 1996–97 (third column). The key issue is the relationship of CSR to teachers moving in and out of K–3.

The student characteristics measures used here are for the entire school, so there is no difference in the measures of race for the different grade grouping. Student characteristics are included in the model and none are significant at the .05 level. As before, the entire model is shown in Appendix 10. First, note the base probability of a move. The 7.3% indicates that 7.3% of K–3 teachers who remained in the same school moved to higher grades. The 9.0% indicates that 9% of K–3 teachers who are from the same school in 1996–97, i.e., not transfers from other schools in the district or other schools, taught higher grades the year before. Thus there was a net flow into K–3 from higher grades within schools.

**TABLE 5.12 ODDS-RATIO AND CHANGE IN PROBABILITY A TEACHER WILL MOVE IN AND OUT OF K–3 BETWEEN 1995–96 AND 1996–97**

| | Teachers Moving Out of K–3 in 1995–96 | Teachers Are in K–3 in 1996–97 |
|---|---|---|
| **Base Probability of a Move** | 7.3% | |
| **Base Probability a K–3 teacher who is not new to a school is from higher grades** | | 9.0% |
| **Effect of CSR in the teachers grade in 1996** | .021<br>(-7.1 percentage points)** | .834<br>(-1.4 percentage points)** |
| **Effect of Class size in teachers grade in 1996** | 1.00<br>(.01) | 1.03<br>(0.3)** |
| **Model Pseudo R-squared** | .133 | .036 |

* significant at the .1 level
** significant at the .05 level
Source: CBEDS PAIF, CCD EDD, Department of Finance, BLS

Not surprisingly, teachers were much less likely to move out of K–3 when CSR was implemented in their schools. What is more surprising is that teachers were also less likely to move into K–3 when CSR was implemented. The odds-ratio below 1 on CSR indicates CSR reduced the probability that a teacher will move into K–3 from higher grades. The odds-ratio above 1 on class size indicates a similar result; larger class sizes in 1996–97 increased the probability that a K–3 teacher was from other grades. In other words, both smaller class size and CSR decrease the probability that a 1996–97 K–3 teacher was from other grades. A possible interpretation is that since CSR reduced movements out of grades, there were relatively fewer available slots for teachers to move into. Another possibility is that experienced K–3 teachers were assigned to reduced classrooms and then experienced grade 4–6 teachers moved into the K–3 classrooms that were not reduced. The end result was that CSR was associated with a reduction in the

number of teachers who moved out of K–3 to near zero, while teachers from higher grades still flowed into K–3, but at a slightly lower rate.

Taken together, the three models of teacher movements show that, when controlling for economic factors, schools with more black or Hispanic students had slightly more teachers leave K–3 during the year before CSR implementation and transferring out to different schools within the district during the first year of CSR.

For illustrative purposes, the results of the analysis are applied in a thought exercise. In this exercise, assume that there are three sets of five schools. Each school has five teachers per grade in K–3, for a total of 100 teachers per set of schools. Each set of teachers and schools has conditions similar to the sample average, except one set of schools has 10% more black students and one set has 10% more Hispanic students. While the differences among the schools being simulated is the proportion of black or Hispanic students, it must be made clear that a causal relationship has not been modeled; instead the differences in outcomes are associated with student characteristics. In other words, more black or Hispanic students did not cause teachers and districts to behave differently, instead these student characteristics have been shown to be associated with different behavior while controlling for many, but not all, factors that have been shown to cause differences in teacher behavior. Table 5.13 shows the relative attrition of these schools.

**TABLE 5.13 SIMULATION OF THE FLOW OF TEACHERS IN & OUT OF SCHOOLS WITHOUT CSR**

| | Average Schools | Average Schools, Except 10% More Black Students | Average Schools, Except 10% More Hispanic Students |
|---|---|---|---|
| **Starting conditions** | 100 | 100 | 100 |
| **Number of teachers who leave the district** | -9 | -10* | -10* |
| **Number of teachers who transfer out to other schools** | -4 | -13* | -8* |
| **Number of teachers who transfer in** | +5[56] | +1[57]* | +2[58]* |
| **Number of teachers who move in from higher grades** | +1 | +1 | +1 |
| **Total number of teachers after movements in and out of schools** | 93 | 79 | 85 |

* The coefficient or combination of coefficients, used in the calculation are significantly different from 0 at the .05 level using the Wald test.

The simulation shown in Table 5.13 makes clear that the transfer of teachers out of schools with more minority students is a key driver of the vacancies in schools. The schools with 10% more black students lose 13 teachers to other schools, while only receiving 1 transfer in from other schools for a net loss of 12 teachers to within district transfers. This can be compared to the average schools that have a net gain of one teacher from within district transfers.

## Modeling the Flow of Teachers Out of Schools with CSR

Recall that CSR was approved and implemented during the summer of 1996. Having occurred so late in the school year, it was not expected to have, nor did the analysis show, a large effect on teachers leaving schools either through quitting the district or transfers to other schools.

56 The base odds are .0472 (or a probability of 4.5%) that a teacher within the district will transfer in. Assume 91% of all teachers remain in the district.

57 The change in odds are .304=.888^10.

58 The change in odds are .306=.924^10

CSR did have an effect on teachers transferring into and moving grades within schools. The effect of CSR on the probability of transferring into a school combines the effects of several odds-ratios. The resulting probabilities are the function of CSR, reduction in class size, and when appropriate students' race and the race CSR interaction term. The final effect on the odds of transferring into a school is the product of the appropriate odds-ratio raised to the power of the change from the average conditions. Class size changed by five from the average of 25 for teachers who remained in a district. CSR is a dummy variable. As before, the race effect is estimated for a 10 percentage point change. The resulting probability is multiplied by 91, which is the approximate number of teachers who remained in each set of schools after quits from the district. Finally each of these combinations of coefficients was subject to the Wald test for being different from zero.

CSR essentially reduced the probability of moving out of K–3 to higher grades to zero while the probability of moving in was reduced slightly. The end result is that moving between grades created a net gain for K–3. The sample in the model of transfers within schools was the teachers who remain in the same school within a given grade in a given year. This means the total number of teachers who moved in should be about 7.6% of the total teachers who remained in a school. A close approximation is seven teachers moved from higher grades per school. The resulting total number of teachers in a school are shown in Table 5.14.

TABLE 5.14 SIMULATION OF TEACHERS IN A SCHOOL WITH CSR

| | Average Schools | Average Schools, Except 10% More Black Students | Average Schools, Except 10% More Hispanic Students |
|---|---|---|---|
| **Total teachers after quits and transfers to other schools** | 87 | 77 | 82 |
| **Transfers from other schools** | +5[59]* | +2[60]* | +3[61]* |
| **Number of teachers who move in from higher grades** | +7 | +7 | +7 |
| **Total number of teachers after movements in and out of schools** | 99 | 86 | 92 |

*The coefficients for the change in probability are significantly different from zero at the .05 level using the Wald test.

Compare Table 5.14 with Table 5.13. CSR clearly increased the flow of teachers from within the district into schools. But the differences between schools remain about the same. Without CSR, the average group of schools had 14 more teachers from within the district than schools with 10% more black students. With CSR, the average group of schools had 13 more teachers.

## Qualification Level of New Teachers

This next section uses a model of teachers who are new to districts to examine the relationship between teacher qualifications (credential and bachelor's degree only) and student characteristics during the first year of CSR. The results are presented in Table 5.15 in a similar fashion as above.

[59] The base odds are .0472, which is equal to a probability of 4.5%. Change in odds is 1.441=.98^-5*1.313^1 for a final P of transferring in of 6.4%.

[60] The change in base odds are .382=1.441*.888^10*.985^10, for a final P of transferring in of 1.8%.

[61] The change in base odds are .659=1.197*.924^10*1.000^10 for a final P of transferring in of 3.0%.

TABLE 5.15 ODDS RATIO AND CHANGE IN PROBABILITY A NEW K–3 TEACHER IS NOT QUALIFIED IN 1996–97

| Characteristic | Mean Sample Proportion | Change in the Base Probability that a New Teacher Is Not Fully Credentialed | Change in the Base Probability a New Teacher Does Not Have Education Above a Bachelor's Degree |
|---|---|---|---|
| **Base Probability** | | 16.6% | 32.3% |
| **Black Students (change in probability from 10 percentage point increase)** | 8% | 1.017<br>(2.6 percentage points)** | 1.008<br>(1.8 percentage points)** |
| **Hispanic Students (change in probability from 10 percentage point increase)** | 39 | 1.01<br>(2.9)** | 1.004<br>(1.1)* |
| **Asian Students (change in probability from 10 percentage point increase)** | 10 | .9865<br>(-1.8)** | 1.013<br>(3.0)** |
| **Free Lunch Eligible Students (change in probability from 10 percentage point increase)** | 52 | .9983<br>(-0.2)** | .9978<br>(-0.5) |

TABLE 5.15 (CONT.) ODDS RATIO AND CHANGE IN PROBABILITY A NEW K–3 TEACHER IS NOT QUALIFIED IN 1996–97

| Characteristic | Mean Sample Proportion | Change in the Base Probability that a New Teacher Is Not Fully Credentialed | Change in the Base Probability a New Teacher Does Not Have Education Above a Bachelor's Degree |
|---|---|---|---|
| **Base Probability** | | 16.6% | 32.3% |
| **Class Size** | 23.1 | .9757<br>(-0.3)** | .9867<br>(-0.3)* |
| **CSR in teacher's grade** | 54 | .5430<br>(-5.6)** | .9489<br>(-1.1) |
| **Black Students & CSR (change in probability from 10 percentage point increase & CSR)** | 4 | 1.005<br>(0.8) | 1.003<br>(0.8) |
| **Hispanic Students & CSR (change in probability from 10 percentage point increase & CSR)** | 18 | .9985<br>(-0.2) | 1.002<br>(0.5) |
| **Asian Students & CSR (change in probability from 10 percentage point increase & CSR)** | 5 | 1.018<br>(2.7)** | .9896<br>(-2.2)** |
| **Free Lunch Eligible Students & CSR (change in probability from 10 percentage point increase & CSR)** | 26 | 1.003<br>(0.4) | .9964<br>(-0.8) |
| **Model Pseudo R-squared** | | .3163 | .1831 |

* significant at the .1 level

** significant at the .05 level

Source: CBEDS PAIF, CCD EDD, Department of Finance, BLS

Table 5.15 shows student characteristics were associated with new teacher qualifications during the first year of CSR. During the first year of CSR, roughly 16.6% of all teachers who were new to their districts that year were not fully credentialed and 32.3% only met

minimal education requirements. In schools with 10% more black students, these probabilities increased by 2.6 and 1.8 percentage points respectively. There were similar changes in teacher qualifications for schools with 10% more Hispanic students. Grades with CSR did receive more fully credentialed and higher educated teachers. The insignificant interaction terms for Hispanics and blacks indicate that CSR did not make schools with more Hispanic or black students any more attractive to fully credentialed or higher educated teachers than it made schools with average proportions of these students.

Teacher qualifications in schools with more Asian students show different patterns than with other minority groups. First, the propensity for new teachers to be fully credentialed moves in the opposite direction as the propensity for teachers to have higher education levels. Increases in the proportion of Asian students increased the probability that a new teacher would be not fully credentialed but decreased the probability that the teacher would only meet minimal education requirements. This behavior shows up in schools both with and without the implementation of CSR. The interaction of CSR with different proportions of Asian students is the only significant interaction term. This suggests that there are possibly different selection priorities, or pools of applicants, in schools with larger proportions of Asian students.

Table 5.16 returns to the thought exercise with three sets of 5 schools with 100 teachers each that was started in the previous section. Recall that at the end of the year, each of these different schools had different amounts of vacancies. The question addressed in Table 5.16 is what were the education and credentialing levels of teachers needed to fill these seats. The table has three sections. The top section uses the sample mean proportions of not fully credentialed and bachelor's degree only teachers (reported in Table 5.9) to predict how many of the returning teachers are not fully credentialed or have a bachelor's degree only. The next section starts with the total number of teachers needed to replace the teachers who left as shown in Table 5.13 above. Using the model results for predicting the new teacher's credentialing and education level, the number of not fully credentialed and bachelor's degree only teachers are predicted. The estimated total number of not fully credentialed and bachelor's degree only teachers are shown in the bottom section.

## TABLE 5.16 SIMULATION OF THE FLOW OF TEACHERS INTO K–3 WITHOUT CSR

| | Average Schools | Average Schools, Except 10% More Black Students | Average Schools, Except 10% More Hispanic Students |
|---|---|---|---|
| **Section 1: Returning teachers after quits, transfers and moves** | 93 | 79 | 85 |
| **Number of not fully credentialed returning teachers[62]** | 1 | 1 | 1 |
| **Number of bachelor's degree only returning teachers[63]** | 10 | 8 | 9 |
| **Section 2: New teachers needed to replace teacher lost to quits and school transfers** | 7 | 21 | 15 |
| **Number of new hires that are not fully credentialed** | 1[64] | 4[65]* | 3[66] |
| **Number of new hires that have bachelor's degree's only** | 2[67] | 7[68] | 5[69] |
| **Section 3: Total number of** | 2 | 5 | 4 |

62 Assuming the returning teachers in all three sets of schools have the same proportion of not fully credentialed teachers as the entire sample, 1.2%.

63 Assuming the returning teachers in all three sets of schools have the same proportion of bachelor's degree only teachers as the entire sample, 10.6%.

64 The base odds that a new teacher was not fully credentialed was .198 or a P of 16.6%.

65 The base odds are multiplied by 1.19=.1.017^10 for a resulting P of not being credentialed of 19.2%. The multiplier is significantly different from zero the .05 level.

66 The base odds are multiplied by 1.21=1.019^10 for a resulting P of not being credentialed of 19.5%. The multiplier is significantly different from zero at the .05 level.

67 The base probability that a new teacher had a bachelor's degree only was 32.3% for a base odds of .477. The multiplier is significantly different from zero at the .05 level.

68 The base odds are multiplied by .1.08=1.008^10 for a resulting P of a bachelors degree only of 34.1%. The multiplier is significantly different from zero at the .05 level.

69 The base odds are multiplied by .1.04=1.004^10 for a resulting P of education above a bachelors of 33.4%. The multiplier is significantly different from zero at the .05 level.

| | Average Schools | Average Schools, Except 10% More Black Students | Average Schools, Except 10% More Hispanic Students |
|---|---|---|---|
| **not fully credentialed teachers** | (2%) | (5%) | (4%) |
| **Total number of bachelor's degree only teachers** | 11<br>(11%) | 15<br>(15%) | 14<br>(14%) |

*the coefficients of the change in probability are not equal to zero at the .05 level.

The end result of this simulation is that schools with more minority students than average have a very different workforce in terms of credentialing and slightly different workforces in terms of education. The key factor driving these differences were more vacancies, which were a direct result of teachers transferring out of these schools to other schools within the districts, and the small number of teachers transferring into these schools. Once these vacancies have been created, there are statistically significant, but relatively small differences in the proportions of well-qualified teacher moving into these positions.

## Movement of Teachers Into Schools With CSR

To simulate the flow of teachers into schools with CSR, we will assume that CSR is implemented in approximately two grades per school. If we assume that each grade to be reduced had five teachers with 29 students, then reduction of two grades would require about 20 additional teachers per set of schools. Recall that CSR reduced the number of teachers who moved out of K–3 while remaining in the same school. Table 5.17 begins with the total number of teachers after quits, transfers, and moves in row 2.

TABLE 5.17 SIMULATED FLOW OF TEACHERS INTO K–3 TO IMPLEMENT CSR IN TWO GRADES

| | Average Schools | Average Schools, Except 10% More Black Students | Average Schools, Except 10% More Hispanic Students |
|---|---|---|---|
| **Section 1: Returning teachers after quits, transfers and moves** | 99 | 86 | 92 |
| **Number of not fully credentialed returning teachers[70]** | 1 | 1 | 1 |
| **Number of bachelor's degree only returning teachers[71]** | 9 | 8 | 9 |
| **Section 2: New teachers needed to replace teacher lost to quits and school transfers and to implement CSR.** | 21 | 34 | 18 |
| **Number of new hires that are not fully credentialed[72]** | 2[73]* | 4[74] | 2[75] |
| **Number of new hires that have bachelor's degree's** | 6[76]* | 11[77] | 6[78] |

[70] Assuming the returning teachers in all three sets of schools have the same proportion of not fully credentialed teachers as the entire sample, 1.2%.

[71] Assuming the returning teachers in all three sets of schools have the same proportion of bachelor's degree only teachers as the entire sample, 10.6%.

[72] The proportions used to make these calculations include the odds-ratios from the CSR coefficient, class size coefficient assuming a reduction of class size by 3 (from a mean of 23 for new teachers to 20), and if appropriate the race and race, CSR interaction coefficient.

[73] The base odds a teacher is not fully credentialed are .198 (P=16.6%). To account for CSR these base odds are multiplied by .574=.617^1*.975^3, to result in a P of not fully credentialed of 10.2%. The multiplier is significantly different from zero at the .05 level using the Wald test.

[74] The base odds are multiplied by .722=574*1.017^10*1.00^10 to result in a P of not fully credentialed of 12.5%. The multiplier is not significantly different from zero at the .05 level using the Wald test, but is significantly different from the multiplier of reduction in the average schools at the .01 level.

[75] The base odds are multiplied by .687=.574*1.01^10*.998^10 to result in a P of not fully credentialed of 12.0%. The multiplier is not significantly different from zero at the .05 level using the Wald test, but is significantly different from the multiplier of reduction in the average schools at the .01 level.

| | Average Schools | Average Schools, Except 10% More Black Students | Average Schools, Except 10% More Hispanic Students |
|---|---|---|---|
| only | | | |
| **Section 3: Total number of not fully credentialed teachers** | 3<br>(2.5%) | 5<br>(4.2%) | 3<br>(2.3%) |
| **Total number of bachelor's degree only teachers** | 15<br>(12.5%) | 19<br>(15.8%) | 15<br>(12.5%) |

*the coefficients of the change in probability are not equal to zero at the .05 level.

The teacher qualifications were higher in schools that implemented CSR. This is due to the higher qualifications of the teachers flowing into these schools. Slightly more new teachers flowing into average schools with CSR were credentialed. At the same time, CSR in schools with higher proportions of blacks or minorities negated the differential in new teacher qualifications seen in schools without CSR. In other words, the distribution of new teachers in schools with more black or Hispanic students closely resembled the distribution of new teachers in average schools without CSR. This is confirmed by the Wald test of whether the coefficients that change the base probability are equal to zero. Using this test it cannot be shown that any CSR changed the distribution of qualified teachers in schools with more black or Hispanic students.

## CONCLUSIONS

This chapter set out to describe an unanticipated "cost" of CSR in California, a decline in teacher qualifications and the concentration of unqualified teachers in schools with more poor or minority students.

Two different approaches were used to isolate the effect of CSR on the qualification of California's teachers. The first is a simple analysis of changes in teacher qualifications in

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[76] The base odds of a bachelor's degree only are .477 (P=32.3%). The account for CSR these base odds are multiplied by .911=.986^3*.948^1 to result in a P of bachelor's degree only of 30.3%. The multiplier is significantly different from zero at the .05 level using the Wald test.

[77] The base odds are multiplied by 1.022=.911*1.008^10*1.003^10 to result in a P of bachelor's degree only of 32.8%. The multiplier is not significantly different from zero at the .05 level using the Wald test, but is significantly different from the multiplier of reduction in the average schools at the .01 level.

[78] The base odds are multiplied by .978=.911*1.004^10*1.002^10 to result in a P of bachelor's degree only of 31.8%. The multiplier is not significantly different from zero at the .05 level using the Wald test, but is significantly different from the multiplier of reduction in the average schools at the .01 level.

elementary, middle and high school over the first years of CSR implementation. This analysis showed clear declines in teacher qualifications in all grade levels, with the largest declines in the elementary grades. The analysis proceeded to look at changes in the distribution of qualified teachers in schools with differing number of low-income students. This analysis showed a concentration of poorly qualified teachers in schools with higher concentrations of low-income students. And again, the largest increase in concentration was found in the elementary grades. An important finding is that the declines in teacher qualifications were not limited to K–3 but extended into grades 4–5 also. The larger changes in the elementary grades where CSR is expected to affect the teacher labor market indicate, but do not prove, that CSR was a contributor to the decline in teacher qualifications.

The second analysis traced the flow of teachers in and out of K–3 classrooms during the first year of CSR implementation. This analysis showed that more teachers transferred out of schools and fewer transferred into schools with higher concentrations of black, and to a lesser extent, Hispanic students. CSR increased the probability that a teacher would transfer into a school. But teachers were still more likely to transfer into reduced classrooms in a school with more white students than a school with more black students. During the first year of CSR implementation, transfers between schools, including transfers into reduced grades, were a net drain of qualified teachers out of schools with more black or Hispanic students.

The end result was that schools with more Hispanic or black students had more vacancies to fill during the first year of CSR. The new teachers who filled these vacancies were less likely to be well qualified. As with transfers, CSR increased the probability that a new teacher would be well qualified. And again, reduced classrooms in schools with more black students were less likely to be filled with a qualified teacher.

This evidence clearly supports the hypotheses that California's CSR implementation had a teacher qualifications cost in terms of the number and distribution of qualified elementary teachers.

Another key issue is the burden on new teachers and under-qualified teachers. CSR pulled experienced, and usually qualified, teachers into reduced classrooms. This left the non-reduced K–3 classes and the larger classes in the higher grades to the new, often under-qualified teachers. K–3 students in 1996–97 who were not in reduced classrooms were more likely to be taught by under-qualified teachers. When K–3 students moved into grades higher than K–3, they were greeted by a teacher corps that was, again, less likely to be qualified, and in almost all cases in class sizes of around 29. The largest concentrations of under-qualified teachers were in schools with the most poor and minority students. This makes clear the need to provide additional support to under-qualified teachers who are more often in larger classes, with more poor and minority students.

With these costs in mind, there are several policy recommendations for state leaders contemplating CSR. Obviously training enough qualified teachers to fill reduced classrooms is key. But this training may take time, detracting from one of CSR's strengths, which is the speed in which it can be implemented. If there is not time to "prime" the teacher-training pump before CSR, then clear efforts need to be made to provide additional training for new, under-qualified teachers.

Since schools with more minority students had difficulty attracting and retaining qualified teachers, mechanisms to make working in these schools more attractive in should be considered. Higher salaries for qualified teachers working in hard-to-staff schools could be one mechanism. Other mechanisms that could be considered include more training opportunities, more support staff, adequate supplies, and additional discretionary resources for teachers to use. The latter two mechanisms were identified by Grissmer et al. (2000) as cost-effective mechanisms for states to improve student performance.

A final recommendation is to first fill new classrooms created by CSR with new teachers. That is, reserve the less-demanding small classrooms for the newer teachers who are the least likely to be well qualified. This should give new teachers an easier environment to learn their trades. It will also expose fewer students to the under-qualified teachers, lessening the number of students who suffer any of the consequences that may come from having new, or under-qualified, teachers.[79] Reserving the new rooms for new teachers will also reduce the drain of teachers out of higher elementary grades, creating fewer vacancies in these grades.

[79] The presence of consequences for elementary students from having under-qualified teachers is a contested question. There may very well be no adverse affect to elementary students from having new or under-qualified teachers.

# CHAPTER 6: DISCUSSION AND CONCLUSIONS

Class size reduction is a popular, if expensive, reform. It has great intuitive appeal to parents, who can easily verify that efforts are being made to improve their children's education. Teachers' unions also support CSR, in part because it results in smaller teacher workloads. Recent research findings can be expected to bolster support for CSR. The support is not as strong among researchers. Hanushek's review of research findings show's no consistent support for smaller class sizes (Hanushek, 1998). Some more recent research has been more supportive of CSR. The evaluation of the third year of CSR in California has again found small, but consistent, improvements in students' performance from CSR (Stecher & Bohrnstedt, 2000). A separate report using data from the National Assessment of Educational Progress (NAEP) showed improved student performance was associated with lower pupil-teacher ratios in lower grades (Grissmer et al., 2000). These more positive research results may overshadow previous research findings that often had much more mixed findings of effectiveness.

Part of the reason CSR is appealing to state-level policymakers is its simplicity. State, and federal, policymakers are several layers removed from the classroom. Not only are they organizationally distanced from where education happens, the links between these organizations are loose. These two factors make it difficult for state-level policymakers to rapidly affect change in the classroom in ways that have fidelity to state-level intentions. The results in California show CSR to be one of the few reforms that can be quickly implemented and show positive outcomes, despite many of the difficulties described in this report.

Recent changes and reforms in education finance are placing state policymakers in an increasingly precarious position. The combination of school equity litigation and tax revolts has resulted in increased centralization of education funding at the state level. This increased centralization has increased the state's role and responsibility in providing for students' education. At the same time, many popular reforms, from school-based management to vouchers, seek to decentralize power over policy and resource allocation decisions to the school level. So while state policymakers' responsibility in the education system has grown, more recent reform efforts work to reduce the influence they have over schools. They are left with little ability to affect the things they are responsible for providing. This may be the appropriate division of power and responsibility. But, this division clearly increases the attractiveness of CSR to state-level policymakers as a policy they can enact which has support among both parents and teacher, that can be implemented relatively quickly, that is easily verifiable in schools, and has research showing its positive effect.

In other words, where one stands on CSR may depend on where one sits. To a state-level policy maker CSR is an effective reform, supported by many parents and teachers, that shows some evidence of positive outcomes. This can be compared to other reforms such

as school-based reform or increasing teacher training, that may be less expensive but are more difficult to quickly implement across a state (Darling-Hammond, 1998, Herman et al., 1999, Bodilly, 1998).

This increased responsibility also creates the need for increased research to support state-level policymaking. This research should focus on improved implementation given the emerging organizational and institutional relationships. A possible route for these relationships was termed “loose-tight coupling” by Boyd and Hartman (1998). In this type of system, states set expectations for performance and play a role in funding. Grissmer highlights one model for this relationship; the state sets standards and uses assessments for accountability. He argues this model was the “most plausible explanation” for improvements in student performance seen in Texas and North Carolina. But Grissmer’s findings have been called into question. Darling-Hammond has argued that improvements in North Carolina are due to teacher policies (1999). This disagreement highlights the need for further research into state education policy implementation.

This report aims to support to state-level policymakers by providing clear guidance on implementing CSR in an efficient and equitable manner. In many ways this report builds upon the experiences in California’s CSR implementation. It was California’s inequities that motivated the research into the cost of CSR. The California CSR evaluation uncovered growing inequities in the distribution of teachers that motivated the additional research in teacher movements.

The findings can help states avoid some of the pitfalls experienced in California and provide new information on alternative funding strategies and teacher movements. While the findings are extensive, there are a few simple policy recommendations that can significantly improve the efficiency and equity of CSR implementation as seen in California:

1. The target method is a much less expensive class size measurement mechanism that results in average class sizes that are closer to the policy goal.
2. CSR in smaller schools (those with under 50 students) is about 10% more expensive than in larger schools.
3. Reallocation of resources from aides to new classrooms can pay for a portion of CSR’s costs, and in some instances cover the entire cost.
4. If states choose to reimburse districts for the cost of CSR, then
    - The “Rules of Thumb” provide a good method to estimate costs, and
    - Reimbursement strategies should account for differences in teacher salaries and class sizes in reimbursement amounts.

5. To counter the potential for growth in inequalities in the distribution of qualified teachers, new classrooms should be filled with new teachers first.

6. Teacher training dollars should follow unqualified teachers.

## APPENDIX 1: DATA DETAILS

### Staffing Data

The staffing data is from the 1997–98 Automated Staff Information System and provided detailed information on all professions employed in elementary schools during 1996–97 and 1997–98. The staffing data provided individual-level information on current teachers in each school including salary, education and experience. Teachers were identified by job title in their first job assignment. Teachers were then classified into three groups based on job assignments as shown in Table 1.

**TABLE 1: TEACHER GROUPING USED IN THE ANALYSIS**

| Group | Teachers of this Group |
|---|---|
| **Regular Education Teachers** | Pre-kindergarten through sixth grade, Title 1, mixed grade, other instruction teachers. |
| **Specialist Teachers** | Art, Music, Foreign Language |
| **Physical Education** | Physical Education |
| **Special Education** | Gifted, Varying Exceptionalities, Educationally Mentally Handicapped, Autistic, etc. |

The groups were used to determine salary and experience levels of elementary teachers and for determining the maximum number of classrooms, including special education, in each school.

### Enrollment Data

The enrollment data are from the 1997–98 Automated Student Information System, which provided school-level enrollment by grade.

### Facilities Data

The facilities data are as of August 4, 1998, and are drawn from the Florida Inventory of Schoolhouses (FISH). FISH is maintained at the state level as part of the state's system for allocating funds for capital expenditures and is used by districts for planning and reporting. The facilities data provide information on all school buildings and rooms inside these buildings, including size, whether permanent or relocatable, number of student stations, and intended use.

These data were used to determine the current number of classrooms available in the school, the presence of relocatable classrooms, and the number of extra classrooms that could be provided by placing classes in rooms that were not intended for use as regular classrooms. The non-traditional settings were broken down into four categories to reflect

different policy decisions regarding use of non-traditional settings for classrooms. Table 3.2 describes these four types of space

**TABLE 2: POLICY CHOICE CATEGORIES FOR ROOMS THAT CAN BE REDESIGNED TO CLASSROOM USE**

| Space Designation | Type of Rooms Included |
|---|---|
| **Specialist Classrooms** | Art, Music, Laboratories (Mostly Computer) And Workrooms |
| **Libraries** | Libraries |
| **Physical Education** | Gymnasiums |
| **Non-Instructional Space** | Lounges, Stages, Multi-Purpose Space And Group Space |

Areas that were built for purposes that could not be discontinued while the school functioned, such as kitchens, dining rooms, hallways, custodial areas, and bathrooms, were not considered as potential classrooms, nor were spaces designed for hazardous material storage.

**Florida Indicators**

The Florida Indicators are published by the state Department of Education[80]. As part of school accountability efforts, these reports provide information on school size, schoolwide average class size, students, teachers, expenditures per student for administration, instruction and exceptional education, and school performance measures such as forth grade test scores, suspension, and promotion rates. These measures are used to augment and verify the descriptions of schools and their students provided in the databases.

**Florida Class Size Reports**

In response to a request by a member of the state Legislature, the Florida State Department of Education gathered information on the number and size of all kindergarten through third grade classrooms in the state. This information does not include data on mixed-grade classrooms. To collect the class size data, the state provided schools and districts with estimates of the number of classrooms by school, grade and class size using information from the Automated Student Information System. Districts verified and returned these estimates to the state in January 1998. The resulting class size database contained enrollment counts that are different from those in the Automated Student Information System because classes were measured at a different time, January 1998 instead of October 1997, and mixed-grade classrooms were not counted. For this dissertation, the enrollment reported from the Automated Student Information System is

[80] The Indicator Reports can be found at: http://www.firn.edu/doe/bin00068/doestart.html.

used unless the class size data contained counts of students in grades where no students were reported in the Automated Student Information System. These class size reports are used in this work to determine the number of classrooms by grade for all kindergarten through third grade students.

### The Common Core

The Common Core of Education Data is gathered and maintained by the U.S. Department of Education. The CCD is "the Department of Education's primary database on public elementary and secondary education in the United States. CCD is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts."[81] Data on all Florida schools whose lowest grade falls within the range of pre-kindergarten to third grade were extracted for 1995-96, which was the most recent school year available on CD-ROM when the analysis began. These data are used for information on school enrollment and locale.

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[81] Taken from the U.S. Department of Education web page on July 9, 2000, located at http://nces.ed.gov/ccd/aboutccd.html. The CCD can be downloaded from http://nces.ed.gov/ccd/ccddata.html.

## APPENDIX 2: SCHOOLS DROPPED FROM FLORIDA SIMULATION

The Florida Department of Education was requested to provide enrollment, staffing, and facilities data for all elementary schools in each of the seven counties. All Indicators reports for elementary schools in the seven districts were downloaded from the web. Class size data were provided for all schools in the state that serve kindergarten through third grades. The Common Core was searched for all schools whose lowest grade is third or below.

To create the final database, the enrollment and staffing data were merged first, using the district and school identification codes provided by the state. This created a base data set of 537 schools upon which all other data sets were merged. Schools were retained in this base data set if they had both student and staff data and enrollment of 15 or more students in any single grade between kindergarten and third. The base data set was merged with the class size data based on school names. There are two schools in the base data set that were not in the class size data set shown in Table 1, and 26 schools in the class size data that were not in the enrollment/staff data set shown in Table 2. Of the 26 schools that were not in the base data, three had fewer than 15 students per grade, six served kindergarten only, and six appear to have special charters (i.e., charter schools or cooperative).

The final data set of 535 schools was merged by name with the Common Core, Indicators, and facilities databases. There were 16 schools in the final database that were not contained in the Common Core. At least some of this difference was due to the two-year difference between when the CCD was collected (1995) and when the remaining data were collected (1997). Florida is a fast-growing state and the addition of new schools in the intervening time is to be expected. All 535 schools are present in the Indicators data, but not all fields of the Indicators data were completely filled. It will be noted when the analysis used incomplete fields from the Indicators data. There are 11 schools that were not contained in the facilities data.

## TABLE 1: SCHOOLS DROPPED BECAUSE THEY WHERE NOT IN THE CLASS SIZE DATA SET

| District | School |
|---|---|
| Broward | Virginia Shuman Young Elem |
| Dade | A.L. Lewis Elementary |

## TABLE 2: SCHOOLS DROPPED BECAUSE THEY WHERE NOT IN THE ENROLLMENT OR STAFF DATA SET

| District | School |
|---|---|
| Alachua | Micanopy Area Cooperative Sch. |
| Broward | Central Charter School |
| Broward | Charter School Of Excellence |
| Broward | City Of Pembroke Pines Charter |
| Broward | Everglades Elementary School |
| Broward | Fox Trail Elementary School |
| Broward | Gator Run Elementary School |
| Broward | Lakeside Elementary School |
| Broward | Nova Blanche Forman Elementary |
| Broward | Nova D.D. Eisenhower Elem |
| Broward | Silver Lakes Elementary School |
| Broward | Somerset Neighborhood School |
| Dade | Coral Reef Montessori Academy |
| Dade | James W. Johnson Elem. School |
| Dade | Laura C. Saunders Elem. School |
| Dade | Linda Lentin Elementary School |
| Dade | West Little River Elementary |
| Hillsborough | Clark Elementary School |
| Hillsborough | Eastside Multi-Cultural School |
| Hillsborough | Just Early Childhood Center |
| Hillsborough | Meacham Early Childhood Center |
| Hillsborough | Pizzo Elementary School |
| Hillsborough | Potter Early Childhood Center |
| Hillsborough | Tampa Downtown Partnership |
| Hillsborough | Valrico Elementary School |
| Hillsborough | Westchase Elementary School |

## APPENDIX 3: PRICE DETAILS

### Teacher Salaries

Teacher salaries are derived from the staff data files from 1996–97 and 1997–98 for all the elementary schools in the sample. Comparing the teachers present in these two files provides information on the new teachers in 1997–98. These new teachers could be new hires, or teachers who transferred to these schools from non-elementary schools, other districts or out of state. The salary data for new teachers are used to set the range of teacher prices. The data are broken into percentiles by salary with the low-end estimate representing at the 25$^{th}$ percentile, the middle estimate at the median, and the high-end estimate at the 75$^{th}$ percentile.

Interviews with Florida district, state and union officials indicate that a large source of new teachers is teachers who relocate from other states, especially in coastal areas. This means that the teacher salary for first-year teachers is likely to underestimate the salary of many of the teachers who would be hired for CSR.

The salaries used in this work are for full-time teachers who spend 100% of their time in K–6 classrooms and are adjusted by 33% to reflect the costs of benefits.[82] Classrooms also require additional substitute support to be used in a classroom when teachers are absent. Based on the Dade County school allocation plans for 1996–97, each new classroom will also include seven substitute days at a price of $75 per day. The total price will be $656 per classroom including benefits. The same benefit adjustment used for teachers was used for substitutes. While substitute teachers do not receive the same retirement and medical benefits as full-time employees, the teacher benefit adjustment is a conservative approximation of the cost of substitute benefits.

These costs are borne by the districts and the state. The relative amount paid by districts and the state varies by district based on the district's relative tax base. Overall, the state contributes about 50% of K–12 funding.[83]

### Teacher's Aides

To estimate the additional cost of elementary aides per classroom, the sum of elementary aide salaries is divided by number of full-time elementary teachers. These calculations do not include aides (or teachers) assigned to special education. Aides benefits costs are assumed to be the same as those for teachers. This conservative approach may overstate

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[82] The adjustment rate was provided in personal communication with officials from the Florida Department of Education.

[83] Taken from the report "How Public Schools Are Funded in Florida" found at www.bor.state.fl.us/educomm/funding.htm.

aides costs since aides may not receive the same benefit package as teachers, and some part-time or temporary aides may not qualify for benefits.

The estimated price per classroom for aides' salaries and benefits is provided in Table 1. Dade's aide price level at $11,000 is almost double the next highest level of Wakulla, which is at $5,645. This is due to a higher intensity in the use of aides. In Dade, the ratio of aides to full-time teachers was .72, compared to Wakulla, which was .43, and the lowest ratio of .28 seen in both Santa Rosa and Alachua. The salary per aide reflects both pay rates and percent of time worked. The average salary is about $10,000, with most districts ranging form $9,000 to $13,000. Alachua had the lowest average salary per aide at $4,900. Thus Alachua's very low expenditures on aides was due to both low intensity of usage and low aides' salaries.

**TABLE 1: ESTIMATED PRICE OF AIDES PER ELEMENTARY CLASSROOM BY DISTRICT**

| District | Aide Salary & Benefits per Classroom |
|---|---|
| **Alachua** | $ 1,791 |
| **Broward** | $ 3,655 |
| **Dade** | $ 11,069 |
| **Hillsborough** | $ 4,533 |
| **Pinellas** | $ 5,015 |
| **Santa Rosa** | $ 4,894 |
| **Wakulla** | $ 5,645 |

## Operations and Maintenance

District-wide averages are provided on the basis of cost per square foot. A key issue is converting cost per square foot into cost per classroom. The minimum square footage for kindergarten and primary student stations is 36 with a recommended size of 38 square feet. The minimum space requirement was used for the allocation of non-traditional classroom space to classrooms. The recommended size is appropriate for new classrooms. The average number of student stations per new classroom constructed between 1989 and 1997 was 21. Based on 38 square feet per student station and 21 student stations per classroom, the average size of a new classroom is just under 800 square feet.

Table 2 shows the average operations, maintenance and utility costs per square foot and estimated cost per classroom for school year 1997–98. Operations, maintenance and utilities costs vary by a factor of two between districts, with the lowest costs in Santa Rosa district at about $3,000 per classroom and the highest costs in Dade district at just under $6,400 per classroom. These costs will be applied to the cost estimates for new classrooms in each district.

**TABLE 2: ESTIMATED AVERAGE OPERATIONS, MAINTENANCE AND UTILITIES COSTS FOR NEW CLASSROOMS, BY DISTRICT**

| School District | Average District Cost Operations, Maintenance & Utilities Cost Per Square Foot | Estimated Cost per Classroom Per New Classroom |
|---|---|---|
| **Alachua** | $ 4.50 | $ 3,601 |
| **Broward** | $ 5.90 | $ 4,722 |
| **Dade** | $ 7.97 | $ 6,378 |
| **Hillsborough** | $ 4.78 | $ 3,824 |
| **Pinellas** | $ 4.77 | $ 3,817 |
| **Santa Rosa** | $ 3.75 | $ 2,997 |
| **Wakulla** | $ 4.83 | $ 3,862 |

## Relocatable Classrooms

Estimates of the cost of a relocatable classroom have considerable variation, potentially because of the reporting on different combinations of resources necessary to use a portable classroom. A complete set of resources includes not only the classroom itself, but cement slab to place the classroom and utility hookups. The prices used here of $4,800 per year for leasing a relocatable, and $30,000 for purchasing a portable as shown in Table 4[84]. This price does not include the cost of student furniture and equipment. Since the number of students does not change with CSR, schools can use the same desks and chairs for students in their new classroom. The new teacher would require some equipment. The cost of this equipment is estimated to be $1,200, which is double the average furniture and equipment cost for a new student station.

**TABLE 3: COST OF RELOCATABLE CLASSROOMS**

| | Cost Estimate | Teacher Furniture & Equipment | Total |
|---|---|---|---|
| **Lease** | $4,800 | $1,200 | $6,000 |
| **Purchase** | $30,000 | $1,200 | 31,200 |

## Purchased Classrooms

The Florida State Department of Education provided information on the price of building new classrooms. As part of the state's capital funding program the state monitors the cost of building and furnishing schools. Table 4 shows the average cost per elementary classroom (teacher station), between 1989 through 1997 and the running averages at the 1997 real dollar level using the CPI-U for shelter. Adjusting to 1997 real dollars is

[84] Both estimates are based on personal interviews with school district officials. Purchased relocatable classrooms are assumed to have a lifetime of 15 years. Each is adequate for a class of up to 25 children.

appropriate for the real dollar adjustment since the school year these estimates are being done for 1997–98 begins in that year. The cost per teacher station varies between years between \$226,914 and 286,533. The weighted[85] average cost over the nine year period was just over \$250,000.

Another issue is the cost for construction of a new school. The State provided information on the size of the 22 new elementary schools built in 1998. These schools varied in size from housing 275 students to 1,079 with an average of 831. The estimate of \$9.9 million per school is in 1997 dollars of, and based on an nine year weighted average cost of \$12,000 per student station and an average size of 831 student stations. Based on the enrollment patterns, it can be assumed each school serves K-5, with relatively equal numbers of students in each grade. This translates to space for about 140 students per grade.

**TABLE 4: CLASSROOM CONSTRUCTION COSTS**

| Calendar Year | Per Teacher Stations | Total Cost Per Teacher Stations (1997 \$) |
|---|---|---|
| 1989 | \$1,088 | \$244,351 |
| 1990 | \$1,764 | \$264,786 |
| 1991 | \$1,380 | \$251,500 |
| 1992 | \$577 | \$235,091 |
| 1993 | \$882 | \$226,914 |
| 1994 | \$1,115 | \$240,227 |
| 1995 | \$1,035 | \$249,394 |
| 1996 | \$749 | \$286,533 |
| 1997 | \$1,154 | \$246,960 |

Source: Office of the Deputy Commissioner for Planning, Budgeting and Management

**TABLE 5: AVERAGE COST OF A SCHOOL**

| | Weighted Average of a School |
|---|---|
| 5-Year Average | \$248,372 |
| 6-Year Average | \$246,982 |
| 7-Year Average | \$247,887 |
| 8-Year Average | \$251,331 |
| 9-Year Average | \$250,551 |

Source: Office of the Deputy Commissioner for Planning, Budgeting and Management

[85] Weighted by number of classrooms.

# APPENDIX 4: SCHOOL-LEVEL CONDITIONS IN THE FLORIDA SAMPLE

### TABLE 1: GRADES K–3 ENROLLMENT

| Enrollment | District Minimum | District Maximum | District Average | Sample Average | Total Enrollment |
|---|---|---|---|---|---|
| Alachua | 156 | 601 | 386 | 523 | 8,870 |
| Broward | 241 | 1,195 | 596 | | 70,353 |
| Dade | 219 | 1,353 | 554 | | 109,130 |
| Hillsborough | 151 | 1,042 | 500 | | 49,969 |
| Pinellas | 180 | 625 | 422 | | 33,740 |
| Santa Rosa | 120 | 1,028 | 456 | | 6,377 |
| Wakulla | 449 | 498 | 467 | | 1,401 |
| | | | | Total | 279,840 |

Source: FEFP, FL Class-Size Reports

### TABLE 2: GRADES K–3 CLASS SIZE

| Class Size | District Minimum | District Maximum | District Average | Sample Average |
|---|---|---|---|---|
| Alachua | 17.3 | 23.6 | 20.7 | 24.4 |
| Broward | 14.5 | 31.5 | 24.7 | |
| Dade | 20.4 | 35.2 | 26.4 | |
| Hillsborough | 13.3 | 26.7 | 21.9 | |
| Pinellas | 18.3 | 23.8 | 21.7 | |
| Santa Rosa | 19.9 | 23.1 | 21.5 | |
| Wakulla | 22.6 | 23.9 | 23.4 | |

**SOURCE: FEFP, FL CLASS-SIZE REPORTS**

## TABLE 3: SINGLE GRADE ENROLLMENT

| Enrollment | District Minimum | District Maximum | District Average | Sample Average |
|---|---|---|---|---|
| Alachua | 32 | 232 | 101 | 132 |
| Broward | 55 | 319 | 149 | |
| Dade | 41 | 365 | 139 | |
| Hillsborough | 23 | 276 | 125 | |
| Pinellas | 40 | 185 | 105 | |
| Santa Rosa | 24 | 375 | 144 | |
| Wakulla | 97 | 137 | 117 | |

Source: FEFP, FL Class-Size Reports

## TABLE 4: SINGLE GRADES CLASS SIZE

| | District Minimum | District Maximum | District Average | Sample Average |
|---|---|---|---|---|
| **Alachua** | 14.8 | 29.3 | 21.0 | 24.4 |
| **Broward** | 12.2 | 45.0 | 24.9 | |
| **Dade** | 13.1 | 41.3 | 26.8 | |
| **Hillsborough** | 10.0 | 32.0 | 22.2 | |
| **Pinellas** | 14.5 | 29.8 | 21.8 | |
| **Santa Rosa** | 13.0 | 31.0 | 22.0 | |
| **Wakulla** | 19.6 | 26.6 | 23.5 | |

Source: FEFP, FL Class-Size Reports

# APPENDIX 5: COST OF CSR BREAKDOWNS

This appendix has 3 parts. The first two parts contain four tables each. Two tables for all schools and two tables only for schools that need to add classrooms to reach the policy goal. Part 1 focuses only on personnel costs. Part 2 contains both personnel and relocatable room costs. Part 3 contains 2 tables of classrooms per student for schools that need to add classrooms.

## Part 1: Personnel costs only, for all schools and then only for schools that need to add classrooms

### TABLE 1: DISTRIBUTION OF PERSONNEL COSTS USING THE TARGET METHOD ACROSS ALL SCHOOLS

| | Class Size Of 15 | | Class Size Of 17 | | Class Size Of 20 | |
|---|---|---|---|---|---|---|
| | Grade | K–3 | Grade | K–3 | Grade | K–3 |
| **Average Cost** | $1,056 | $1,062 | $725 | $728 | $382 | $368 |
| **St. Deviation** | $420 | $337 | $378 | $298 | $307 | $238 |
| **Minimum Cost** | $- | $- | $- | $- | $- | $- |
| **First Quartile** | $780 | $811 | $468 | $507 | $- | $172 |
| **Median Cost** | $1,069 | $1,082 | $728 | $742 | $378 | $368 |
| **Third Quartile** | $1,351 | $1,348 | $986 | $972 | $602 | $560 |
| **Maximum Cost** | $2,138 | $1,897 | $1,710 | $1,459 | $1,408 | $1,022 |

Source: FEFP, FL Class-Size Reports, Florida Indicators

### TABLE 2: DISTRIBUTION OF PERSONNEL COSTS USING THE CEILING METHOD ACROSS ALL SCHOOLS

| | Class size of 15 | | Class size of 17 | | Class size of 20 | |
|---|---|---|---|---|---|---|
| | Grade | K–3 | Grade | K–3 | Grade | K–3 |
| **Average Cost** | $1,220 | $1,104 | $891 | $774 | $528 | $406 |
| **St. Deviation** | $423 | $338 | $391 | $298 | $337 | $244 |
| **Minimum Cost** | $- | $- | $- | $- | $- | $- |
| **First Quartile** | $949 | $848 | $636 | $557 | $314 | $216 |
| **Median Cost** | $1,220 | $1,119 | $898 | $786 | $525 | $414 |
| **Third Quartile** | $1,509 | $1,395 | $1,162 | $1,012 | $759 | $608 |
| **Maximum Cost** | $2,397 | $1,897 | $1,965 | $1,532 | $1,643 | $1,095 |

Source: FEFP, FL Class-Size Reports, Florida Indicators

## TABLE 3: DISTRIBUTION OF PERSONNEL COSTS USING THE TARGET METHOD FOR SCHOOLS THAT NEED TO ADD CLASSROOMS

| | Class size of 15 | | Class size of 17 | | Class size of 20 | |
|---|---|---|---|---|---|---|
| | **Grade** | **K–3** | **Grade** | **K–3** | **Grade** | **K–3** |
| **Average Cost** | $1,092 | $1,068 | $795 | $742 | $536 | $416 |
| **St. Deviation** | $379 | $329 | $317 | $283 | $223 | $210 |
| **Minimum Cost** | $183 | $61 | $184 | $78 | $147 | $46 |
| **First Quartile** | $813 | $816 | $553 | $515 | $349 | $227 |
| **Median Cost** | $1,083 | $1,083 | $774 | $754 | $503 | $426 |
| **Third Quartile** | $1,365 | $1,348 | $1,015 | $977 | $677 | $573 |
| **Maximum Cost** | $2,138 | $1,897 | $1,710 | $1,459 | $1,408 | $1,022 |

Source: FEFP, FL Class-Size Reports, Florida Indicators,

## TABLE 4: DISTRIBUTION OF PERSONNEL COSTS USING THE CEILING METHOD FOR SCHOOLS THAT NEED TO ADD CLASSROOMS

| | Class size of 15 | | Class size of 17 | | Class size of 20 | |
|---|---|---|---|---|---|---|
| | **Grade** | **K–3** | **Grade** | **K–3** | **Grade** | **K–3** |
| **Average Cost** | $1,242 | $1,110 | $934 | $786 | $626 | $445 |
| **St. Deviation** | $393 | $329 | $347 | $285 | $270 | $219 |
| **Minimum Cost** | $251 | $121 | $214 | $74 | $110 | $46 |
| **First Quartile** | $961 | $851 | $670 | $564 | $410 | $255 |
| **Median Cost** | $1,230 | $1,120 | $922 | $790 | $595 | $441 |
| **Third Quartile** | $1,517 | $1,398 | $1,182 | $1,014 | $808 | $622 |
| **Maximum Cost** | $2,397 | $1,897 | $1,965 | $1,532 | $1,643 | $1,095 |

Source: FEFP, FL Class-Size Reports, Florida Indicators

## Part 2: Personnel and relocatable room costs, first for all schools and then only when classrooms need to be added

### TABLE 5: DISTRIBUTION OF PERSONNEL AND RELOCATABLE ROOM COSTS USING THE TARGET METHOD FOR ALL SCHOOLS

| | Class size of 15 | | Class size of 17 | | Class size of 20 | |
|---|---|---|---|---|---|---|
| | Grade | K–3 | Grade | K–3 | Grade | K–3 |
| **Average Cost** | $1,326 | $1,334 | $910 | $914 | $479 | $462 |
| **St. Deviation** | $526 | $422 | $473 | $373 | $385 | $299 |
| **Minimum Cost** | $- | $- | $- | $- | $- | $- |
| **First Quartile** | $981 | $1,019 | $588 | $638 | $- | $216 |
| **Median Cost** | $1,343 | $1,358 | $915 | $935 | $476 | $462 |
| **Third Quartile** | $1,697 | $1,690 | $1,237 | $1,219 | $755 | $702 |
| **Maximum Cost** | $2,681 | $2,379 | $2,145 | $1,830 | $1,765 | $1,281 |

Source: FEFP, FL Class-Size Reports, Florida Indicators

### TABLE 6: DISTRIBUTION OF PERSONNEL AND RELOCATABLE ROOM COSTS USING THE CEILING METHOD FOR ALL SCHOOLS

| | Class size of 15 | | Class size of 17 | | Class size of 20 | |
|---|---|---|---|---|---|---|
| | Grade | K–3 | Grade | K–3 | Grade | K–3 |
| **Average Cost** | $1,532 | $1,386 | $1,119 | $972 | $662 | $509 |
| **St. Deviation** | $529 | $422 | $490 | $373 | $423 | $306 |
| **Minimum Cost** | $- | $- | $- | $- | $- | $- |
| **First Quartile** | $1,194 | $1,068 | $802 | $702 | $394 | $271 |
| **Median Cost** | $1,535 | $1,403 | $1,127 | $987 | $659 | $520 |
| **Third Quartile** | $1,894 | $1,749 | $1,457 | $1,269 | $954 | $762 |
| **Maximum Cost** | $3,006 | $2,379 | $2,465 | $1,921 | $2,070 | $1,372 |

Source: FEFP, FL Class-Size Reports, Florida Indicators

### TABLE 7: DISTRIBUTION OF PERSONNEL AND RELOCATABLE ROOM COSTS USING THE TARGET METHOD FOR SCHOOLS THAT NEED TO ADD CLASSROOMS

| | Class size of 15 | | Class size of 17 | | Class size of 20 | |
|---|---|---|---|---|---|---|
| | Grade | K–3 | Grade | K–3 | Grade | K–3 |
| **Average Cost** | $1,371 | $1,341 | $999 | $931 | $673 | $522 |
| **St. Deviation** | $474 | $411 | $397 | $354 | $280 | $263 |
| **Minimum Cost** | $229 | $ 76 | $232 | $ 99 | $185 | $ 58 |
| **First Quartile** | $1,024 | $1,027 | $695 | $648 | $440 | $286 |
| **Median Cost** | $1,358 | $1,359 | $972 | $945 | $630 | $535 |
| **Third Quartile** | $1,713 | $1,690 | $1,273 | $1,225 | $849 | $718 |
| **Maximum Cost** | $2,681 | $2,379 | $2,145 | $1,830 | $1,765 | $1,281 |

Source: FEFP, FL Class-Size Reports, Florida Indicators

## TABLE 8: DISTRIBUTION OF PERSONNEL AND RELOCATABLE ROOM COSTS USING THE CEILING METHOD FOR SCHOOLS THAT NEED TO ADD CLASSROOMS

| | Class size of 15 | | Class size of 17 | | Class size of 20 | |
|---|---|---|---|---|---|---|
| | **Grade** | **K–3** | **Grade** | **K–3** | **Grade** | **K–3** |
| **Average Cost** | $1,560 | $1,394 | $1,172 | $987 | $786 | $559 |
| **St. Deviation** | $491 | $410 | $434 | $356 | $339 | $274 |
| **Minimum Cost** | $315 | $152 | $269 | $ 93 | $137 | $ 58 |
| **First Quartile** | $1,210 | $1,070 | $843 | $710 | $515 | $321 |
| **Median Cost** | $1,547 | $1,404 | $1,157 | $992 | $750 | $552 |
| **Third Quartile** | $1,904 | $1,753 | $1,483 | $1,272 | $1,016 | $780 |
| **Maximum Cost** | $3,006 | $2,379 | $2,465 | $1,921 | $2,070 | $1,372 |

Source: FEFP, FL Class-Size Reports, Florida Indicators

## Part 3: Classrooms per student for schools that need to add classrooms to reach the policy goal

**TABLE 9: DISTRIBUTION OF COSTS IN CLASSROOMS PER STUDENT USING THE TARGET METHOD FOR SCHOOLS THAT NEED TO ADD CLASSROOMS**

| | Class size of 15 | | Class size of 17 | | Class size of 20 | |
|---|---|---|---|---|---|---|
| | **Grade** | **K–3** | **Grade** | **K–3** | **Grade** | **K–3** |
| **Average Cost** | 0.0251 | 0.0246 | 0.0182 | 0.0169 | 0.0120 | 0.0093 |
| **St. Deviation** | 0.0071 | 0.0055 | 0.0061 | 0.0052 | 0.0044 | 0.0041 |
| **Minimum Cost** | 0.0050 | 0.0014 | 0.0048 | 0.0021 | 0.0035 | 0.0012 |
| **First Quartile** | 0.0204 | 0.0214 | 0.0137 | 0.0134 | 0.0085 | 0.0059 |
| **Median Cost** | 0.0256 | 0.0253 | 0.0182 | 0.0176 | 0.0115 | 0.0095 |
| **Third Quartile** | 0.0303 | 0.0287 | 0.0225 | 0.0208 | 0.0150 | 0.0124 |
| **Maximum Cost** | 0.0444 | 0.0389 | 0.0385 | 0.0299 | 0.0333 | 0.0210 |

Source: FEFP, FL Class-Size Reports, Florida Indicators

**TABLE 10: DISTRIBUTION OF COSTS IN CLASSROOMS PER STUDENT USING THE CEILING METHOD FOR SCHOOLS THAT NEED TO ADD CLASSROOMS**

| | Class size of 15 | | Class size of 17 | | Class size of 20 | |
|---|---|---|---|---|---|---|
| | **Grade** | **K–3** | **Grade** | **K–3** | **Grade** | **K–3** |
| Average Cost | 0.0287 | 0.0256 | 0.0214 | 0.0180 | 0.0142 | 0.0100 |
| St. Deviation | 0.0073 | 0.0054 | 0.0067 | 0.0051 | 0.0055 | 0.0042 |
| Minimum Cost | 0.0060 | 0.0029 | 0.0051 | 0.0020 | 0.0030 | 0.0012 |
| First Quartile | 0.0242 | 0.0223 | 0.0168 | 0.0148 | 0.0099 | 0.0067 |
| Median Cost | 0.0292 | 0.0264 | 0.0217 | 0.0184 | 0.0137 | 0.0104 |
| Third Quartile | 0.0336 | 0.0295 | 0.0260 | 0.0218 | 0.0179 | 0.0133 |
| Maximum Cost | 0.0645 | 0.0389 | 0.0444 | 0.0314 | 0.0435 | 0.0225 |

Source: FEFP, FL Class-Size Reports, Florida Indicators

## APPENDIX 6: COST SAVINGS FROM CONVERTING SPACE INTO CLASSROOMS

Total costs are estimated when all classroom needs are met using relocatable classrooms at a cost of $6,000 per classroom. Savings are estimated when classroom needs are replaced with the various types of non-traditional space.

**TABLE 1: SAVINGS WHEN CLASSROOM NEEDS ARE DETERMINED USING THE CEILING METHOD**

| Non-Traditional Space Usage | Class size of 15 | | Class size of 17 | | Class size of 20 | |
|---|---|---|---|---|---|---|
| | Grade | K–3 | Grade | K–3 | Grade | K–3 |
| **Savings from using extra space** | 4% | 2% | 5% | 3% | 6% | 4% |
| **Savings from using Specialist Classrooms** | 55% | 20% | 62% | 28% | 69% | 44% |
| **Savings from using Libraries** | 46% | 14% | 58% | 19% | 77% | 33% |
| **Savings from using Gymnasiums** | 14% | 4% | 19% | 6% | 28% | 11% |
| **Savings from using non-instructional space** | 26% | 8% | 33% | 11% | 42% | 19% |
| **Total Cost** | $12,552 | $43,698 | $9,402 | $30,660 | $5,940 | $16,164 |

Source: FEFP, FL Class-Size Reports, Florida Indicators

**TABLE 2: SAVINGS WHEN CLASSROOM NEEDS ARE DETERMINED USING THE TARGET METHOD**

| Non-Traditional Space Usage | Class size of 15 | | Class size of 17 | | Class size of 20 | |
|---|---|---|---|---|---|---|
| | Grade | K–3 | Grade | K–3 | Grade | K–3 |
| **Savings from using extra space** | 5% | 2% | 5% | 3% | 6% | 4% |
| **Savings from using Specialist Classrooms** | 58% | 21% | 64% | 29% | 73% | 46% |
| **Savings from using Libraries** | 50% | 14% | 65% | 20% | 83% | 35% |
| **Savings from using Gymnasiums** | 16% | 4% | 22% | 6% | 33% | 12% |
| **Savings from using non-instructional space** | 28% | 8% | 36% | 12% | 47% | 20% |
| **Total Cost (thousands)** | $11,262 | $42,192 | $7,968 | $29,046 | $4,908 | $14,754 |

Source: FEFP, FL Class-Size Reports, Florida Indicators

## APPENDIX 6: REGRESSION COEFFICIENTS FROM CSR COST MODEL

Regression coefficients for CSR cost model. Insignificant coefficients are indicated with an asterisk.

| | Class size of 15 | | Class size of 17 | | Class size of 20 | |
|---|---|---|---|---|---|---|
| | **Ceiling** | **Target** | **Ceiling** | **Target** | **Ceiling** | **Target** |
| **Existing class size** | 1.67E-03 | 1.66E-03 | 1.60E-03 | 1.53E-03 | 1.38E-03 | 1.25E-03 |
| **Enrollment** | -2.18E-05 | *-4.2E-7 | -3.38E-05 | 7.35E-06 | -4.59E-05 | -9.18E-06 |
| **Enrollment squared** | 3.32E-08 | *2.45E-9 | 5.04E-08 | -8.53E-09 | 6.97E-08 | 1.40E-08 |
| **Enrollment cubed** | -1.55E-11 | *-1.54E-12 | *-2.3E-11 | 3.49E-12 | -3.20E-11 | -5.82E-12 |
| **Enrollment less than 49** | 1.00E-02 | 3.79E-03 | 5.89E-03 | 7.50E-03 | 1.18E-02 | 1.39E-02 |
| **Enrollment between 50 & 99** | 1.19E-03 | *-2.52E-4 | 7.05E-04 | 9.14E-04 | *1,17E-4 | 1.16E-03 |
| **Enrollment over 250** | -4.83E-05 | *4.74E-5 | 9.06E-04 | *-8,42E-4 | 1.31E-03 | *1.302E-4 |
| **Constant** | -1.03E-02 | -1.57E-02 | -1.47E-02 | -2.11E-02 | -1.63E-02 | -1.99E-02 |

Source: FEFP, FL Class-Size Reports, Florida Indicators

# APPENDIX 8: COMPARISON OF REIMBURSEMENT METHODS

This appendix has two parts. The first part compares the accuracy of reimbursement methods at the district level. The second uses a graph to show the relationship of reimbursement method accuracy and the quality of class size information.

## Part 1: Accuracy of Reimbursement Methods at the District Level

True differences between actual cost and reimbursement strategies at the district level. Negative differences represent underpayment using that strategy and are shown in parentheses.

**TABLE 1: TARGET METHOD, DISTIRCT LEVELDIFFERENCES BETWEEN ACTUAL COST AND REIMBURSEMENT STRATEGIES**

| | 1. Sample level | 2. District level | 3. School level | 4. Rules of Thumb |
|---|---|---|---|---|
| **Alachua** | $3,716,770 | $2,531,808 | $ 2,473,460 | $ 2,360,285 |
| **Broward** | $1,381,484 | $9,680,460 | $ 9,121,650 | $ 8,283,080 |
| **Dade** | $(24,904,276) | $(10,396,587) | $(10,412,260) | $(10,171,733) |
| **Hillsborough** | $13,605,699 | $7,833,346 | $ 7,999,389 | $ 7,810,435 |
| **Pinellas** | $11,120,947 | $3,787,346 | $ 4,356,737 | $ 4,745,028 |
| **Santa Rosa** | $2,340,417 | $ 519,788 | $469,779 | $561,323 |
| **Wakulla** | $ 211,370 | $ (91,574) | $(83,934) | $ (85,947) |

Source: FEFP, FL Class-Size Reports, Florida Indicators, August 1996 Capital FTE estimates

**TABLE 2: CEILING METHOD, DISTRICT-LEVEL DIFFERENCES BETWEEN ACTUAL COST AND REIMBURSEMENT STRATEGIES,**

| | 1. Sample level | 2. District level | 3. School level | 4. Rules of Thumb |
|---|---|---|---|---|
| **Alachua** | $3,273,740 | $2,531,808 | $ 2,473,460 | $ 2,360,285 |
| **Broward** | $(1,742,389) | $9,680,460 | $ 9,121,650 | $ 8,283,080 |
| **Dade** | $(30,466,287) | $(10,396,587) | $(10,412,260) | $(10,171,733) |
| **Hillsborough** | $11,891,811 | $7,833,346 | $ 7,999,389 | $ 7,810,435 |
| **Pinellas** | $9,586,579 | $3,787,346 | $ 4,356,737 | $ 4,745,028 |
| **Santa Rosa** | $2,070,939 | $ 519,788 | $469,779 | $561,323 |
| **Wakulla** | $ 162,081 | $ (91,574) | $(83,934) | $ (85,947) |

Source: FEFP, FL Class-Size Reports, Florida Indicators, August 1996 Capital FTE estimates

Differences between actual cost and reimbursement strategies using 50% more accurate class size estimates.

**TABLE 3: TARGET METHOD, DISTRICT-LEVEL DIFFERENCES BETWEEN ACTUAL COST AND REIMBURSEMENT STRATEGIES USING IMPROVED CLASS SIZE ESTIMATES**

| | 1. Sample level | 2. District level | 3. School level | 4. Rules of Thumb |
|---|---|---|---|---|
| **Alachua** | $ 400,347 | $(110,758) | $ 436,305 | $ 388,297 |
| **Broward** | $(3,209,517) | $ (1,747,251) | $1,234,184 | $1,307,966 |
| **Dade** | $(12,886,579) | $ (7,227,558) | $ (706,374) | $ (725,395) |
| **Hillsborough** | $ 899,698 | $ (1,297,318) | $1,424,095 | $1,030,754 |
| **Pinellas** | $ 709,929 | $ (1,306,610) | $ 743,883 | $ 718,428 |
| **Santa Rosa** | $ 233,413 | $(314,391) | $ 200,050 | $ 190,899 |
| **Wakulla** | $ (21,412) | $(36,967) | $ 11,698 | $ (7,055) |

Source: FEFP, FL Class-Size Reports, Florida Indicators, August 1996 Capital FTE estimates

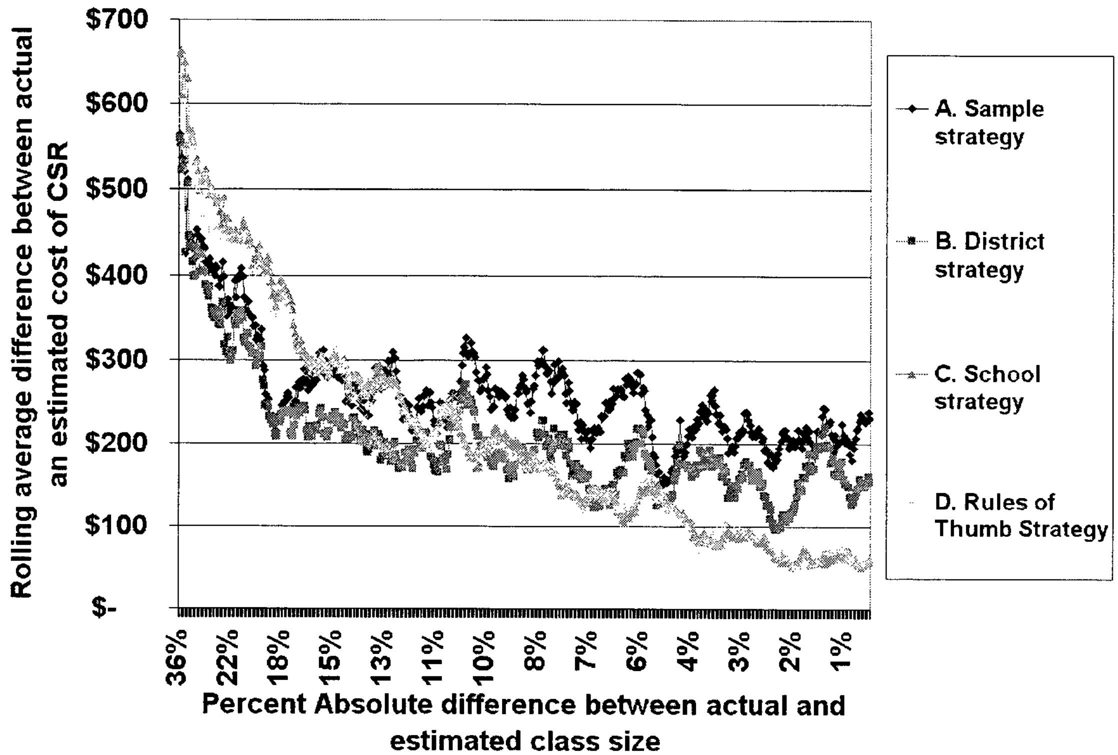
**TABLE 4: CEILING METHOD, DISTRICT-LEVEL DIFFERENCES BETWEEN ACTUAL COST AND REIMBURSEMENT STRATEGIES USING IMPROVED CLASS SIZE ESTIMATES**

| | 1. Sample level | 2. District level | 3. School level | 4. Rules of Thumb |
|---|---|---|---|---|
| Alachua | $ 776,922 | $ 236,451 | $ 325,547 | $ 341,728 |
| Broward | $ (641,587) | $ 802,505 | $ 737,849 | $ 522,303 |
| Dade | $(7,660,734) | $ (2,033,307) | $(1,498,893) | $(1,670,172) |
| Hillsborough | $2,589,782 | $ 373,005 | $ 696,391 | $ 663,021 |
| Pinellas | $2,304,234 | $ 269,877 | $ 372,462 | $ 580,638 |
| Santa Rosa | $ 424,294 | $(158,678) | $ 92,679 | $ 85,895 |
| Wakulla | $ 15,554 | $(37,911) | $ (49,913) | $ (39,741) |

Source: FEFP, FL Class-Size Reports, Florida Indicators, August 1996 Capital FTE estimates

## Part 2: School-Level Comparison of Reimbursement Strategies and Cost for Reduction in Four-Grades Using the Ceiling Method

FIGURE 1: ABSOLUTE DIFFERENT AT THE SCHOOL LEVEL BETWEEN REIMBURSEMENTS AND COST, CEILING MEHTOD




Source: FEFP, FL Class-Size Reports, Florida Indicators, August 1996 Capital FTE estimates

### TABLE 5: SUM OF ABSOLUTE DIFFERENCE BETWEEN ACTUAL COST AND SCHOOL LEVEL ESTIMATES (In Thousands)

| | Actual Cost | Sample Wide | District | School | Rules of Thumb |
|---|---|---|---|---|---|
| Target Four Grade | $36,068 | $70,962 | $57,511 | $57,575 | $56,695 |
| Ceiling Four Grade | $47,751 | $71,882 | $57,512 | $58,076 | $56,895 |
| Target Single Grade | $138,519 | $17,560 | $14,154 | $16,246 | $14,454 |
| Ceiling Single Grade | $151,215 | $20,441 | $17,034 | $17,080 | $15,906 |

### TABLE 5: SUM OF ABSOLUTE DIFFERENCE BETWEEN ACTUAL COST AND REIMBURSMENT ESTIMATES AT THE SCHOOL LEVEL USING IMPROVED CLASS SIZE ESTIMATES (In Thousands)

| | Actual Cost | Sample Wide | District | School | Rules of Thumb |
|---|---|---|---|---|---|
| Target Four Grade | $138,519 | $70,806 | $57,439 | $32,076 | $31,888 |
| Ceiling Four Grade | $151,215 | $71,599 | $57,802 | $33,761 | $32,968 |
| Target Single Grade | $36,068 | $17,518 | $14,133 | $10,780 | $8,242 |
| Ceiling Single Grade | $47,751 | $20,994 | $17,779 | $13,339 | $11,642 |

## APPENDIX 9: DESCRIPTORS OF CALIFORNIA TEACHERS BETWEEN 1995–96 AND 1998–99

This appendix has 13 parts. Part 1 provides basic demographic information on grades 4–5, 7–8 and 10–12 teacher workforces. Part 2 provide information on the school groupings used to describe the teacher distribution in elementary schools. Parts 3–6 provide information on the distribution of K–3 teacher characteristics (experience, education, credentialing and characteristics of novice teachers) by various school groupings. Parts 7–10 repeat the analysis done for K–3 teachers for grades 4–5 teachers. Part 11 provides information on the school classifications (low-income and minority) used to describe the distributions of grades 7–8 and 10–12 teachers. The final two parts, 11 and 12 describe the distribution of grades 7–8 and 10–12 teacher characteristics (experience, education and credentialing) for the by the school grouping used to analyze these workforces.

### Part 1: Demographic Changes in the Statewide Grades 4–5, 7–8 and 10–12 Teacher Workforces

This section provides basic demographic information, similar to what is presented in table 3.2, for the grades 4–5, 7–8 and 10–12 teacher workforces. The proportion of new teachers is not available for 1996–97 due to an unusual amount of missing experience data in that year.

**TABLE 1: DEMOGRAPHIC CHANGES IN CALIFORNIA'S 4–5 TEACHER WORKFORCE FROM 1995–96 TO 1998–99**

| Demographics | 1995–96 | 1996–97 | 1997–98 | 1998–99 |
|---|---|---|---|---|
| **Total Number of 4–5 Teachers** | 22,248 | 22,519 | 23,333 | 24,322 |
| **Percentage of First-Year Teachers** | 5% | n/a | 12% | 13% |
| **Mean Number of Students per Teacher** | 29.7 | 29.6 | 29.3 | 29.0 |
| **White** | 79% | 79% | 77% | 75% |
| **Hispanic** | 9% | 10% | 11% | 11% |
| **Asian** | 6% | 6% | 7% | 6% |
| **African American** | 5% | 5% | 5% | 5% |
| **American Indian** | 0.7% | 0.7% | 0.8% | 0.7% |
| **Male** | 57% | 57% | 57% | 57% |

Source CBEDS-PAIF

**TABLE 2: DEMOGRAPHIC CHANGES IN CALIFORNIA'S 7–8 TEACHER WORKFORCE FROM 1995–96 TO 1998–99**

| Demographics | 1995–96 | 1996–97 | 1997–98 | 1998–99 |
|---|---|---|---|---|
| Total Number of 7–8 Teachers | 27,738 | 29,061 | 29,608 | 30,599 |
| Percentage of First-Year Teachers | 7% | n/a | 8% | 9% |
| | | | | |
| Mean Number of Students per Teacher | 34.5 | 33.0 | 33.0 | 33.3 |
| White | 81% | 81% | 80% | 79% |
| Hispanic | 8% | 8% | 9% | 9% |
| Asian | 4% | 4% | 4% | 4% |
| African American | 6% | 6% | 6% | 6% |
| American Indian | 0.9% | 0.9% | 0.9% | 0.9% |
| Male | 43% | 43% | 43% | 43% |

Source CBEDS-PAIF

**TABLE 3: DEMOGRAPHIC CHANGES IN CALIFORNIA'S 10–12 TEACHER WORKFORCE FROM 1995–96 TO 1998–99**

| Demographics | 1995–96 | 1996–97 | 1997–98 | 1998–99 |
|---|---|---|---|---|
| Total Number of 10–12 Teachers | 33,802 | 35,664 | 38,260 | 39,083 |
| Percentage of First-Year Teachers | 5% | n/a | 6% | 6% |
| | | | | |
| Mean Number of Students per Teacher | 32.0 | 31.0 | 31.6 | 31.9 |
| White | 82% | 82% | 81% | 80% |
| Hispanic | 8% | 9% | 9% | 10% |
| Asian | 4% | 4% | 4% | 4% |
| African American | 4% | 4% | 5% | 5% |
| American Indian | 0.9% | 0.9% | 1% | 0.9% |
| Male | 56% | 56% | 55% | 55% |

Source CBEDS-PAIF

## Part 2: Categories Used to Describe the Distribution of Elementary Teachers

The following four tables describe the elementary school categorizations used throughout Chapter 4 and this appendix. Each table shows the definitions of the categories followed by the number of schools, K–3 teachers and percentage of K–3 teachers in that category. Schools where assigned to the categories in school year 1996–97, the first year of CSR implementation. The total number of schools and teachers is not the same in each category due to a small number of schools dropped due to missing information.

### TABLE 4: POVERTY QUARTILE DEFINITION AND SIZE IN 1996–97

| Quartile Definition | Number of Schools | Number of K–3 teachers | Percent of K–3 teacher |
|---|---|---|---|
| **Poverty quartile 1. Schools with 7.49% or less AFDC eligible students** | 1,124 | 15,801 | 21.46 |
| **Poverty quartile 2. Schools with 7.5% to 17.49% AFDC eligible students** | 1,148 | 16,456 | 22.35 |
| **Poverty quartile 3. Schools with 17.5 to & 29.9% AFDC eligible students** | 1,184 | 18,370 | 24.95 |
| **Poverty quartile 4. Schools with 30% or more AFDC eligible students** | 1,291 | 23,006 | 31.24 |

Source: California Basic Education Data System

### TABLE 5: ELL QUARTILE DEFINITION AND SIZE IN 1996–97

| Category Definition | Number of Schools | Number of K–3 teachers | Percent of K–3 teachers |
|---|---|---|---|
| **ELL quartile 1. Schools with 7.49% or less ELL students** | 1,192 | 16,595 | 22.86 |
| **ELL quartile 2. Schools with 7.5% to 19.99% ELL students** | 1,041 | 14,664 | 20.20 |
| **ELL quartile 3. Schools with 20% to 39.9% ELL students** | 1,108 | 17,158 | 23.64 |
| **ELL quartile 4. Schools with 40% or more ELL students** | 1,232 | 24,166 | 33.29 |

Source: California Basic Education Data System

### TABLE 6: MINORITY (NON-WHITE) QUARTILE DEFINITION AND SIZE IN 1996–97

| Quartile Definition | Number of Schools | Number of K–3 teachers | Percent of K–3 teachers |
|---|---|---|---|
| **Minority quartile 1. Schools with 24.99% or less minority students** | 950 | 11,905 | 16.15% |
| **Minority quartile 2. Schools with 25% to 49.99% minority students** | 1,081 | 15,141 | 20.55% |
| **Minority quartile 3. Schools with 50% to 74.99% minority students** | 1,045 | 15,821 | 21.47% |
| **Minority quartile 4. Schools with 75% or more minority students** | 1,677 | 30,826 | 41.83% |

Source: California Basic Education Data System, Professional Assignment Information Forms

## TABLE 7: HISPANIC GROUP DEFINITION AND SIZE IN 96-97

| Group Definition | Number of Schools | Number of K–3 teachers | Percent of K–3 teachers |
|---|---|---|---|
| Hispanic group 1. Schools with 16.67% or less Hispanic students | 1,548 | 20,138 | 27.33% |
| Hispanic group 2. Schools with 16.66% to 49.99% Hispanic students | 1,774 | 26.594 | 36.09% |
| Hispanic group 3. Schools with 50% or more Hispanic students | 1,431 | 26,961 | 36.59% |

Source: California Basic Education Data System, Professional Assignment Information Forms

## Part 3: K–3 Teacher Experience by School Descriptors

The following six tables show the proportion of novice K–3 teachers in the given school categories for school years 1995–96, 1997–98 and 1998–99. Data for school year 1996–97 is not included due to an unusually high proportion of missing experience data. The first column of each table shows the school categories. Columns two, three and four show the percentage of novice teachers in each quartile for the respective school years. Each cell represents the percentage of novice teachers in schools in that quartile, in that year. For example, in 1995–96 14.2 percent of the K–3 teachers in schools in income quartile 1 were novices, which means 85.8 percent (100–14.2) of the teachers in these schools were not novices.

**TABLE 8: K–3 TEACHER EXPERIENCE BY STUDENT INCOME QUARTILES**

| | 1995–96 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|
| **Income quartile 1. % novice teachers in schools with 7.49% or fewer AFDC eligible students** | 14.2% | 24.9% | 24.2% |
| **Income quartile 2. % novice teachers in schools with 7.5% to 17.49% AFDC eligible students** | 14.4 | 25.9 | 26.0 |
| **Income quartile 3. % novice teachers in schools with 17.5% to 29.9% AFDC eligible students** | 17.4 | 29.2 | 30.1 |
| **Income quartile 4. % novice teachers in schools with 30% or more AFDC eligible students** | 21.6 | 31.0 | 34.1 |

Source CBEDS-PAIF 1996–97 percentage of novices omitted due to an unusually high proportion of missing experience data

**TABLE 9: K–3 TEACHER EXPERIENCE BY STUDENT ELL QUARTILES**

| | 1995–96 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|
| **ELL quartile 1. % novice teachers in schools with 7.49% or fewer ELL students** | 12.5% | 22.6% | 22.5% |
| **ELL quartile 2. % novice teachers in schools with 7.5% to 19.99% ELL students** | 13.7 | 25.4 | 25.4 |
| **ELL quartile 3. % novice teachers in schools with 20% to 39.9% ELL students** | 18.0 | 28.6 | 29.9 |
| **ELL quartile 4. % novice teachers in schools with 40% or more ELL students** | 22.6 | 33.3 | 35.7 |

Source: CBEDS-PAIF. 1996–97 percentage of novices omitted due to an unusually high proportion of missing experience data.

**TABLE 10: K–3 TEACHER EXPERIENCE AND SCHOOL MINORITY (NON-WHITE) QUARTILES**

| | 1995–96 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|
| **Minority quartile 1. % novice teachers in schools with 24.99% or fewer minority students** | 11.7% | 22.3% | 21.4% |
| **Minority quartile 2. % novice teachers in schools with 25% to 49.99% minority students** | 14.0 | 24.5 | 24.2 |
| **Minority quartile 3. % novice teachers in schools with 50% to 74.99% minority students** | 15.4 | 27.2 | 28.4 |
| **Minority quartile 4. % novice teachers in schools with 75% or more minority students** | 22.1 | 32.4 | 34.9 |

Source: CBEDS-PAIF. 1996–97 percentage of novices omitted due to an unusually high proportion of missing experience data.

**TABLE 11: K–3 TEACHER EXPERIENCE AND SCHOOL HISPANIC GROUPS**

| | 1995–96 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|
| **Hispanic group 1. % novice teachers in schools with 16.67% or fewer Hispanic students** | 12.8% | 23.3% | 22.8% |
| **Hispanic group 2. % novice teachers in schools with 16.68% to 49.99% Hispanic students** | 15.8% | 27.0% | 27.8% |
| **Hispanic group 3. % novice teachers in schools with 50% or more Hispanic students** | 22.2% | 32.6% | 35.0% |

Source: CBEDS-PAIF. 1996–97 percentage of novices omitted due to an unusually high proportion of missing experience data.

## Part 4: K–3 Teacher Education by School Categorizations

The following four tables show the proportion of bachelor's degree only teachers in the given school categories for school years 1995–96 to 1998–99. The first column of each table shows the school categories. Columns two through five show the percentage of bachelor's degree only teachers in each quartile for the respective school years. Each cell represents the percentage of bachelor's degree only teachers in schools in that quartile, in that year. For example, in 1995–96 9.9 percent of the K–3 teachers in schools in income quartile 1 had a bachelor's degrees only, which means 90.1 percent (100–9.9) of the teachers in these schools had at least 30 semester hours beyond a bachelor's degree..

## TABLE 12: K–3 TEACHER PERCENT BACHELOR'S DEGREE ONLY BY STUDENT INCOME QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Income quartile 1. % bachelor's degree only teachers in schools with 7.49% or fewer AFDC eligible students** | 9.9% | 11.3% | 12.9% | 12.9% |
| **Income quartile 2. % bachelor's degree only teachers in schools with 7.5% to 17.49% AFDC eligible students** | 12.0 | 15.5 | 17.6 | 18.4 |
| **Income quartile 3. % bachelor's degree only teachers in schools with 17.5% to 29.9% AFDC eligible students** | 17.0 | 21.8 | 24.5 | 26.3 |
| **Income quartile 4. % bachelor's degree only teachers in schools with 30% or more AFDC eligible students** | 25.2 | 28.5 | 31.4 | 34.1 |

Source CBEDS-PAIF

## TABLE 13: K–3 TEACHER PERCENT BACHELOR'S DEGREE ONLY BY STUDENT ELL QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **ELL quartile 1. % bachelor's degree only teachers in schools with 7.49% or fewer ELL students** | 10.8% | 12.3% | 13.9% | 13.5% |
| **ELL quartile 2. % bachelor's degree only teachers in schools with 7.5% to 19.99% ELL students** | 13.2 | 15.7 | 17.2 | 17.5 |
| **ELL quartile 3. % bachelor's degree only teachers in schools with 20% to 39.9% ELL students** | 15.5 | 18.8 | 21.3 | 23.3 |
| **ELL quartile 4. % bachelor's degree only teachers in schools with 40% or more ELL students** | 24.7 | 29.8 | 33.0 | 36.1 |

Source: CBEDS-PAIF

## TABLE 14: K–3 TEACHER PERCENT BACHELOR'S DEGREE ONLY AND SCHOOL MINORITY (NON-WHITE) QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Minority quartile 1. % bachelor's degree only teachers in schools with 24.99% or fewer minority students** | 9.1% | 10.2% | 10.9% | 11.0% |
| **Minority quartile 2. % bachelor's degree only teachers in schools with 25% to 49.99% minority students** | 11.7 | 13.2 | 14.9 | 14.5 |
| **Minority quartile 3. % bachelor's degree only teachers in schools with 50% to 74.99% minority students** | 14.4 | 18.5 | 20.9 | 21.6 |
| **Minority quartile 4. % bachelor's degree only teachers in schools with 75% or more minority students** | 23.8 | 28.4 | 31.6 | 34.9 |

Source: CBEDS-PAIF

**TABLE 15: K–3 TEACHER PERCENT BACHELOR'S DEGREE ONLY AND SCHOOL HISPANIC GROUPS**

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Hispanic group 1. % bachelor's degree only teachers in schools with 16.67% or fewer Hispanic students** | 10.1% | 11.8% | 12.9% | 13.5% |
| **Hispanic group 2. % bachelor's degree only teachers in schools with 16.68% to 49.99% Hispanic students** | 14.8% | 17.7% | 19.6% | 21.2% |
| **Hispanic group 3. % bachelor's degree only teachers in schools with 50% or more Hispanic students** | 24.0% | 29.0% | 32.5% | 34.4% |

Source: CBEDS-PAIF

## Part 5: K–3 Teacher Credentialing for School Groupings

The following four tables show the proportion of not fully credentialed teachers in the given school categories for school years 1995–96 to 1998–99. The first column of each table shows the school categories described in Part 1 of this appendix. Columns two through five show the percentage of not fully credentialed teachers in each quartile for the respective years. Each cell represents the percentage of not fully credentialed teachers in schools in that quartile, in that year. For example, .4 percent of the K–3 teachers in schools in income quartile 1 were not fully credentialed, which means 99.6 percent (100–0.4) of the teachers in these schools were fully credentialed.

## TABLE 16: K–3 TEACHER PERCENT NOT FULLY CREDENTIALED BY STUDENT INCOME QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Income quartile 1. % not fully credentialed teachers in schools with 7.49% or fewer AFDC eligible students** | 0.4% | 1.5% | 4.3% | 4.3% |
| **Income quartile 2. % not fully credentialed teachers in schools with 7.5% to 17.49% AFDC eligible students** | 0.7 | 3.0 | 8.2 | 8.4 |
| **Income quartile 3. % not fully credentialed teachers in schools with 17.5% to 29.9% AFDC eligible students** | 1.9 | 4.9 | 14.2 | 15.3 |
| **Income quartile 4. % not fully credentialed teachers in schools with 30% or more AFDC eligible students** | 3.2 | 5.7 | 19.6 | 21.2 |

Source CBEDS-PAIF

## TABLE 17: K–3 TEACHER PERCENT NOT FULLY CREDENTIALED BY STUDENT ELL QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **ELL quartile 1. % not fully credentialed teachers in schools with 7.49% or fewer ELL students** | 0.3% | 1.4% | 4.1% | 4.1% |
| **ELL quartile 2. % not fully credentialed teachers in schools with 7.5% to 19.99% ELL students** | 0.6 | 2.5 | 7.0 | 6.9 |
| **ELL quartile 3. % not fully credentialed teachers in schools with 20% to 39.9% ELL students** | 1.5 | 4.2 | 11.3 | 12.1 |
| **ELL quartile 4. % not fully credentialed teachers in schools with 40% or more ELL students** | 3.7 | 6.7 | 22.3 | 24.4 |

Source: CBEDS-PAIF

## TABLE 18: K–3 TEACHER PERCENT NOT FULLY CREDENTIALED AND SCHOOL MINORITY (NON-WHITE) QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Minority quartile 1. % not fully credentialed teachers in schools with 24.99% or fewer minority students** | 0.3% | 0.8% | 2.4% | 2.2% |
| **Minority quartile 2. % not fully credentialed teachers in schools with 25% to 49.99% minority students** | 0.4 | 1.7 | 5.3 | 5.3 |
| **Minority quartile 3. % not fully credentialed teachers in schools with 50% to 74.99% minority students** | 0.8 | 3.3 | 9.4 | 9.7 |
| **Minority quartile 4. % not fully credentialed teachers in schools with 75% or more minority students** | 3.4 | 6.7 | 21.1 | 23.1 |

Source: CBEDS-PAIF

## TABLE 19: K–3 TEACHER PERCENT NOT FULLY CREDENTIALED AND SCHOOL HISPANIC GROUPS

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Hispanic group 1. % not fully credentialed teachers in schools with 16.67% or fewer Hispanic students** | 0.4% | 1.2% | 3.6% | 3.5% |
| **Hispanic group 2. % not fully credentialed teachers in schools with 16.68% to 49.99% Hispanic students** | 1.1 | 3.5 | 8.8 | 9.4 |
| **Hispanic group 3. % not fully credentialed teachers in schools with 50% or more Hispanic students** | 3.4 | 6.5 | 22.2 | 23.8 |

Source: CBEDS-PAIF

## Part 6: Novice K–3 Teacher Characteristics in 1998–99 for School Groupings

The following four tables give information on novice K–3 teachers in schools during 1998–99 by school category.. The first column shows the familiar category definitions. The second column is taken directly from the tables in Part 1 and shows the increase in novice K–3 teachers for schools in the different quartiles between 1995–96 and 1998–99. The third column shows the percentage of novice teachers with bachelor's degree only in school year 1998–99 for schools in the given quartile. The final column shows the percentage of novice teachers who were not fully credentialed in schools in the given quartile in 1998–99. For example, in 1998–99 in income quartile 1 schools 30.1 percent of the novice teachers had a bachelor's degree only, and 15.1 percent of the same novices where not fully credentialed. In other words, 69.9 percent of the novice teachers in income quartile 1 schools had education beyond a bachelor's degree and 84.9 percent were fully credentialed

**TABLE 20: 1998–99 NOVICE K–3 TEACHERS AND STUDENT INCOME QUARTILES**

| | 1995–96 to 1998–99 increase in share of novice teachers | 1998–99 percentage of novice teachers who have a bachelor's only | 1998–99 percentage of novice teachers who are not fully credentialed |
|---|---|---|---|
| **Income quartile 1. Schools with 7.49% or fewer AFDC eligible students** | 10.0 percentage points | 30.1% | 15.1% |
| **Income quartile 2. Schools with 7.5% to 17.49% AFDC eligible students** | 11.6 | 42.0 | 28.2 |
| **Income quartile 3. Schools with 17.5% to 29.9% AFDC eligible students** | 12.7 | 52.8 | 43.1 |
| **Income quartile 4. Schools with 30% or more AFDC eligible students** | 12.5 | 61.9 | 51.5 |

Source: CBEDS-PAIF

## TABLE 20: 1998–99 NOVICE K–3 TEACHERS AND STUDENT ELL QUARTILES

| | 1995–96 to 1998–99 increase in share of novice teachers | 1998–99 percentage of novice teachers who have a bachelor's only | 1998–99 percentage of novice teachers who are not fully credentialed |
|---|---|---|---|
| **ELL quartile 1. Schools with 7.49% or less ELL students** | 10.0% percentage points | 33.3% | 15.3% |
| **ELL quartile 2. Schools with 7.5% to 19.99% ELL students** | 11.7 | 40.5 | 23.7 |
| **ELL quartile 3. Schools with 20% to 39.9% ELL students** | 11.9 | 46.8 | 34.6 |
| **ELL quartile 4. Schools with 40% or more ELL students** | 13.1 | 63.2 | 56.8 |

Source: CBEDS-PAIF

## TABLE 21: 1998–99 NOVICE K–3 TEACHERS AND STUDENT MINORITY (NON-WHITE) QUARTILES

| | 1995–96 to 1998–99 increase in share of novice teachers | 1998–99 percentage of novice teachers who have a bachelor's only | 1998–99 percentage of novice teachers who are not fully credentialed |
|---|---|---|---|
| **Minority quartile 1. Schools with 24.99% or less minority students** | 9.7 % percentage points | 26.2% | 8.1% |
| **Minority quartile 2. Schools with 25% to 49.99% minority students** | 10.2 | 35.4 | 19.2 |
| **Minority quartile 3. Schools with 50% to 74.99% minority students** | 13.0 | 44.7 | 29.8 |
| **Minority quartile 4. Schools with 75% or more minority students** | 12.8 | 62.4 | 55.1 |

Source: CBEDS-PAIF

**TABLE 22: 1998–99 NOVICE K–3 TEACHERS AND S STUDENT HISPANIC GROUPINGS**

| | 1995–96 to 1998–99 increase in share of novice teachers | 1998–99 percentage of novice teachers who have a bachelor's only | 1998–99 percentage of novice teachers who are not fully credentialed |
|---|---|---|---|
| **Hispanic group 1. Schools with 16.67% or less Hispanic students** | 10.1 % percentage points | 31.4% | 31.4% |
| **Hispanic group 2. Schools with 16.68% to 49.99% Hispanic students** | 12.0 | 44.9 | 44.9 |
| **Hispanic group 3. Schools with 50% or more Hispanic students** | 12.8 | 62.3 | 62.3 |

Source: CBEDS-PAIF

## Part 7: 4–5 Teacher Experience for School Descriptors

The following four tables show the proportion of 4–5 novice teachers in the given school categories for school years 1995–96, 1997–98 and 1998–99. Data for school year 1996–97 is not included due to an unusually high proportion of missing experience data. The first column of each table shows the school categories. Columns two, three and four show the percentage of novice teachers in each quartile for the respective school years. Each cell represents the percentage of novice 4–5 teachers in schools in that quartile, in that year. For example, in 1995–96 13.9 percent of the 4–5 teachers in schools in income quartile 1 were novices, which means 16.1 percent (100–13.9) of the teachers in these schools were not novices.

**TABLE 23: 4–5 TEACHER EXPERIENCE BY STUDENT INCOME QUARTILES**

| | 1995–96 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|
| **Income quartile 1. % novice teachers in schools with 7.49% or fewer AFDC eligible students** | 13.9% | 20.4% | 25.4% |
| **Income quartile 2. % novice teachers in schools with 7.5% to 17.49% AFDC eligible students** | 13.2 | 23.5 | 28.4 |
| **Income quartile 3. % novice teachers in schools with 17.5% to 29.9% AFDC eligible students** | 15.3 | 25.5 | 33.2 |
| **Income quartile 4. % novice teachers in schools with 30% or more AFDC eligible students** | 18.6 | 28.5 | 36.6 |

Source CBEDS-PAIF 1996–97 percentage of novices omitted due to an unusually high proportion of missing experience data

### TABLE 24: 4–5 TEACHER EXPERIENCE BY STUDENT ELL QUARTILES

| | 1995–96 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|
| **ELL quartile 1. % novice teachers in schools with 7.49% or fewer ELL students** | 12.7% | 19.6% | 24.4% |
| **ELL quartile 2. % novice teachers in schools with 7.5% to 19.99% ELL students** | 12.8 | 22.2 | 27.8 |
| **ELL quartile 3. % novice teachers in schools with 20% to 39.9% ELL students** | 16.6 | 26.6 | 33.1 |
| **ELL quartile 4. % novice teachers in schools with 40% or more ELL students** | 18.9 | 29.5 | 38.2 |

Source: CBEDS-PAIF. 1996–97 percentage of novices omitted due to an unusually high proportion of missing experience data.

### TABLE 25: 4–5 TEACHER EXPERIENCE AND SCHOOL MINORITY (NON-WHITE) QUARTILES

| | 1995–96 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|
| **Minority quartile 1. % novice teachers in schools with 24.99% or fewer minority students** | 11.8% | 18.8% | 22.5% |
| **Minority quartile 2. % novice teachers in schools with 25% to 49.99% minority students** | 13.0 | 21.7 | 27.0 |
| **Minority quartile 3. % novice teachers in schools with 50% to 74.99% minority students** | 14.7 | 24.4 | 31.1 |
| **Minority quartile 4. % novice teachers in schools with 75% or more minority students** | 18.8 | 29.1 | 37.5 |

Source: CBEDS-PAIF. 1996–97 percentage of novices omitted due to an unusually high proportion of missing experience data.

### TABLE 26: 4–5 TEACHER EXPERIENCE AND SCHOOL HISPANIC GROUPS

| | 1995–96 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|
| **Hispanic group 1. % novice teachers in schools with 16.67% or fewer Hispanic students** | 12.6% | 19.9% | 24.6% |
| **Hispanic group 2. % novice teachers in schools with 16.68% to 49.99% Hispanic students** | 14.5 | 25.2 | 31.2 |
| **Hispanic group 3. % novice teachers in schools with 50% or more Hispanic students** | 18.9 | 28.3 | 37.0 |

Source: CBEDS-PAIF. 1996–97 percentage of novices omitted due to an unusually high proportion of missing experience data.

## Part 8: 4–5 Teacher Education by School Categorizations

The following four tables show the proportion of 4–5 bachelor's degree only teachers in the given school categories for school years 1995–96 to 1998–99. The first column of each table shows the school categories. Columns two through five show the percentage of bachelor's degree only teachers in each quartile for the respective school years. Each cell represents the percentage of bachelor's degree only teachers in schools in that quartile, in that year. For example, in 1995–96 8.6 percent of the 4–5 teachers in schools in income quartile 1 had a bachelor's degrees only, which means 91.4 percent (100–8.6) of the teachers in these schools had at least 30 semester hours beyond a bachelor's degree.

**TABLE 27: 4–5 TEACHER PERCENT BACHELOR'S DEGREE ONLY BY STUDENT INCOME QUARTILES**

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Income quartile 1. % bachelor's degree only teachers in schools with 7.49% or fewer AFDC eligible students** | 8.6% | 9.0% | 10.9% | 12.7% |
| **Income quartile 2. % bachelor's degree only teachers in schools with 7.5% to 17.49% AFDC eligible students** | 11.3 | 12.0 | 15.7 | 19.5 |
| **Income quartile 3. % bachelor's degree only teachers in schools with 17.5% to 29.9% AFDC eligible students** | 16.3 | 19.2 | 23.0 | 26.6 |
| **Income quartile 4. % bachelor's degree only teachers in schools with 30% or more AFDC eligible students** | 21.9 | 24.6 | 28.6 | 34.5 |

Source CBEDS-PAIF

## TABLE 28: 4–5 TEACHER PERCENT BACHELOR'S DEGREE ONLY BY STUDENT ELL QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **ELL quartile 1. % bachelor's degree only teachers in schools with 7.49% or fewer ELL students** | 9.3% | 10.1% | 12.5% | 13.9% |
| **ELL quartile 2. % bachelor's degree only teachers in schools with 7.5% to 19.99% ELL students** | 12.3 | 12.5 | 14.6 | 17.8 |
| **ELL quartile 3. % bachelor's degree only teachers in schools with 20% to 39.9% ELL students** | 14.8 | 16.3 | 19.3 | 23.9 |
| **ELL quartile 4. % bachelor's degree only teachers in schools with 40% or more ELL students** | 22.0 | 25.9 | 31.3 | 36.9 |

Source: CBEDS-PAIF

## TABLE 29: 4–5 TEACHER PERCENT BACHELOR'S DEGREE ONLY AND SCHOOL MINORITY (NON-WHITE) QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Minority quartile 1. % bachelor's degree only teachers in schools with 24.99% or fewer minority students** | 8.2% | 8.3% | 9.5% | 10.9% |
| **Minority quartile 2. % bachelor's degree only teachers in schools with 25% to 49.99% minority students** | 10.6 | 10.6 | 12.7 | 15.0 |
| **Minority quartile 3. % bachelor's degree only teachers in schools with 50% to 74.99% minority students** | 13.2 | 15.1 | 18.4 | 22.0 |
| **Minority quartile 4. % bachelor's degree only teachers in schools with 75% or more minority students** | 21.6 | 25.0 | 29.9 | 35.8 |

Source: CBEDS-PAIF

**TABLE 30: 4–5 TEACHER PERCENT BACHELOR'S DEGREE ONLY AND SCHOOL HISPANIC GROUPS**

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Hispanic group 1. % bachelor's degree only teachers in schools with 16.67% or fewer Hispanic students** | 9.2% | 9.8% | 11.4% | 12.9% |
| **Hispanic group 2. % bachelor's degree only teachers in schools with 16.68% to 49.99% Hispanic students** | 13.4 | 14.8 | 17.9 | 22.7 |
| **Hispanic group 3. % bachelor's degree only teachers in schools with 50% or more Hispanic students** | 21.7 | 24.7 | 29.9 | 34.5 |

Source: CBEDS-PAIF

## Part 9: 4–5 Teacher Credentialing for School Groupings

The following four tables show the proportion of not fully credentialed 4–5 teachers in the given school categories for school years 1995–96 to 1998–99. The first column of each table shows the school categories. Columns two through five show the percentage of not fully credentialed teachers in each quartile for the respective years. Each cell represents the percentage of not fully credentialed teachers in schools in that quartile, in that year. For example, .3 percent of the 4–5 teachers in schools in income quartile 1 were not fully credentialed, which means 99.7 percent (100–0.3) of the teachers in these schools were fully credentialed.

### TABLE 31: 4–5 TEACHER PERCENT NOT FULLY CREDENTIALED BY STUDENT INCOME QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Income quartile 1. % not fully credentialed teachers in schools with 7.49% or fewer AFDC eligible students** | 0.3% | 0.7% | 3.2% | 4.6% |
| **Income quartile 2. % not fully credentialed teachers in schools with 7.5% to 17.49% AFDC eligible students** | 0.6 | 1.4 | 7.4 | 10.1 |
| **Income quartile 3. % not fully credentialed teachers in schools with 17.5% to 29.9% AFDC eligible students** | 1.2 | 3.1 | 12.6 | 17.1 |
| **Income quartile 4. % not fully credentialed teachers in schools with 30% or more AFDC eligible students** | 2.7 | 4.0 | 18.1 | 23.3 |

Source CBEDS-PAIF

### TABLE 32: 4–5 TEACHER PERCENT NOT FULLY CREDENTIALED BY STUDENT ELL QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **ELL quartile 1. % not fully credentialed teachers in schools with 7.49% or fewer ELL students** | 0.3% | 0.7% | 3.6% | 5.1% |
| **ELL quartile 2. % not fully credentialed teachers in schools with 7.5% to 19.99% ELL students** | 0.5 | 1.4 | 6.7 | 9.4 |
| **ELL quartile 3. % not fully credentialed teachers in schools with 20% to 39.9% ELL students** | 1.1 | 2.9 | 11.4 | 14.4 |
| **ELL quartile 4. % not fully credentialed teachers in schools with 40% or more ELL students** | 2.9 | 4.2 | 19.5 | 25.7 |

Source: CBEDS-PAIF

## TABLE 33: 4–5 TEACHER PERCENT NOT FULLY CREDENTIALED AND SCHOOL MINORITY (NON-WHITE) QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Minority quartile 1. % not fully credentialed teachers in schools with 24.99% or fewer minority students** | 0.2% | 0.4% | 1.8% | 2.7% |
| **Minority quartile 2. % not fully credentialed teachers in schools with 25% to 49.99% minority students** | 0.3 | 0.9 | 5.2 | 6.9 |
| **Minority quartile 3. % not fully credentialed teachers in schools with 50% to 74.99% minority students** | 0.7 | 2.2 | 8.3 | 12.2 |
| **Minority quartile 4. % not fully credentialed teachers in schools with 75% or more minority students** | 2.7 | 4.3 | 19.3 | 24.8 |

Source: CBEDS-PAIF

## TABLE 34: 4–5 TEACHER PERCENT NOT FULLY CREDENTIALED AND SCHOOL HISPANIC GROUPS

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Hispanic group 1. % not fully credentialed teachers in schools with 16.67% or fewer Hispanic students** | 0.2% | 0.5% | 3.1% | 4.4% |
| **Hispanic group 2. % not fully credentialed teachers in schools with 16.68% to 49.99% Hispanic students** | 0.9 | 2.1 | 9.3 | 12.2 |
| **Hispanic group 3. % not fully credentialed teachers in schools with 50% or more Hispanic students** | 2.6 | 4.3 | 18.9 | 24.9 |

Source: CBEDS-PAIF

## Part 10: Novice 4–5 Teacher Characteristics in 1997–98 for School Groupings

The following four tables give information on novice 4–5 teachers in schools during 1998–99 by school category.. The first column shows the familiar category definitions. The second column is taken directly from the tables in Part 5 and shows the increase in novice 4–5 teachers for schools in the different quartiles between 1995–96 and 1998–99. The third column shows the percentage of novice teachers with bachelor's degree only in school year 1998–99 for schools in the given quartile. The final column shows the percentage of novice teachers who were not fully credentialed in schools in the given quartile in 1998–99. For example, in 1998–99 in income quartile 1 schools 31.5 percent of the novice teachers had a bachelor's degree only, and 15.7 percent of the same novices where not fully credentialed. In other words, 68.5 percent of the novice teachers in income quartile 1 schools had education beyond a bachelor's degree and 84.3 percent were fully credentialed

## TABLE 35: 1998–99 NOVICE 4–5 TEACHERS AND STUDENT INCOME QUARTILES

| | 1995–96 to 1998–99 increase in share of novice teachers | 1998–99 percentage of novice teachers who have a bachelor's only | 1998–99 percentage of novice teachers who are not fully credentialed |
|---|---|---|---|
| **Income quartile 1. Schools with 7.49% or fewer AFDC eligible students** | 11.5 percentage points | 31.5% | 15.7% |
| **Income quartile 2. Schools with 7.5% to 17.49% AFDC eligible students** | 15.1 | 43.4 | 32.3 |
| **Income quartile 3. Schools with 17.5% to 29.9% AFDC eligible students** | 18.0 | 53.7 | 45.6 |
| **Income quartile 4. Schools with 30% or more AFDC eligible students** | 18.0 | 63.0 | 54.5 |

Source: CBEDS-PAIF

## TABLE 36: 1998–99 NOVICE 4–5 TEACHERS AND STUDENT ELL QUARTILES

| | 1995–96 to 1998–99 increase in share of novice teachers | 1998–99 percentage of novice teachers who have a bachelor's only | 1998–99 percentage of novice teachers who are not fully credentialed |
|---|---|---|---|
| **ELL quartile 1. Schools with 7.49% or less ELL students** | 11.7 percentage points | 35.8% | 18.7% |
| **ELL quartile 2. Schools with 7.5% to 19.99% ELL students** | 15.0 | 42.0 | 30.2 |
| **ELL quartile 3. Schools with 20% to 39.9% ELL students** | 16.6 | 47.3 | 37.7 |
| **ELL quartile 4. Schools with 40% or more ELL students** | 19.3 | 64.8 | 58.5 |

Source: CBEDS-PAIF

## TABLE 37: 1998–99 NOVICE 4–5 TEACHERS AND STUDENT MINORITY (NON-WHITE) QUARTILES

| | 1995–96 to 1998–99 increase in share of novice teachers | 1998–99 percentage of novice teachers who have a bachelor's only | 1998–99 percentage of novice teachers who are not fully credentialed |
|---|---|---|---|
| **Minority quartile 1. Schools with 24.99% or less minority students** | 10.7 percentage points | 28.9% | 10.1% |
| **Minority quartile 2. Schools with 25% to 49.99% minority students** | 14.0 | 35.9 | 23.0 |
| **Minority quartile 3. Schools with 50% to 74.99% minority students** | 16.4 | 46.4 | 35.0 |
| **Minority quartile 4. Schools with 75% or more minority students** | 18.7 | 63.9 | 57.4 |

Source: CBEDS-PAIF

## TABLE 38: 1998–99 NOVICE 4–5 TEACHERS AND S STUDENT HISPANIC GROUPINGS

| | 1995–96 to 1998–99 increase in share of novice teachers | 1998–99 percentage of novice teachers who have a bachelor's only | 1998–99 percentage of novice teachers who are not fully credentialed |
|---|---|---|---|
| **Hispanic group 1. Schools with 16.67% or less Hispanic students** | 11.9 percentage points | 32.0% | 4.4% |
| **Hispanic group 2. Schools with 16.68% to 49.99% Hispanic students** | 16.7 | 47.7 | 12.2 |
| **Hispanic group 3. Schools with 50% or more Hispanic students** | 18.1 | 63.1 | 24.9 |

Source: CBEDS-PAIF

## Part 11: Grade 7–8 and 10–12 School Classifications

This section describes two different categorizations of schools with grade 7–8 and 10–12 teachers based on student characteristics in 1996–97. The cutpoints for the quartiles are the same as was used for the elementary quartiles to facilitate comparisons between teachers in each school category.

**TABLE 39: INCOME GRADE 7–8 QUARTILE DEFINITION AND SIZE**

| Quartile Definition | Number of Schools | Number of 7–8 Teachers | Percentage of 7–8 Teachers |
|---|---|---|---|
| **Income quartile 1. Schools with 7.49% or less AFDC eligible students** | 458 | 7,391 | 25.6% |
| **Income quartile 2. Schools with 7.5% to 17.49% AFDC eligible students** | 470 | 8,325 | 28.8 |
| **Income quartile 3. Schools with 17.5% to & 29.9% AFDC eligible students** | 399 | 7,848 | 27.1 |
| **Income quartile 4. Schools with 30% or more AFDC eligible students** | 264 | 5,349 | 18.5 |

Source: CBEDS-PAIF

**TABLE 40: MINORITY (NON-WHITE) GRADE 7–8 QUARTILE DEFINITION AND SIZE**

| Quartile Definition | Number of Schools | Number of 7–8 Teachers | Percentage of 7–8 Teachers |
|---|---|---|---|
| **Minority quartile 1. Schools with 24.99% or less minority students** | 352 | 4,621 | 15.9% |
| **Minority quartile 2. Schools with 25% to 49.99% minority students** | 405 | 7,101 | 24.5 |
| **Minority quartile 3. Schools with 50% to 74.99% minority students** | 374 | 7,337 | 25.3 |
| **Minority quartile 4. Schools with 75% or more minority students** | 485 | 9,939 | 34.3 |

Source: CBEDS-PAIF

### TABLE 41: INCOME GRADE 10–12 QUARTILE DEFINITION AND SIZE

| Quartile Definition | Number of Schools | Number of 7–8 Teachers | Percentage of 7–8 Teachers |
|---|---|---|---|
| **Income quartile 1. Schools with 7.49% or less AFDC eligible students** | 483 | 12,090 | 34.5% |
| **Income quartile 2. Schools with 7.5% to 17.49% AFDC eligible students** | 418 | 11,524 | 32.9 |
| **Income quartile 3. Schools with 17.5% to & 29.9% AFDC eligible students** | 292 | 7,847 | 22.4 |
| **Income quartile 4. Schools with 30% or more AFDC eligible students** | 136 | 3,565 | 10.2 |

Source: CBEDS-PAIF

### TABLE 42: MINORITY (NON-WHITE) GRADE 7–8 QUARTILE DEFINITION AND SIZE

| Quartile Definition | Number of Schools | Number of 7–8 Teachers | Percentage of 7–8 Teachers |
|---|---|---|---|
| **Minority quartile 1. Schools with 24.99% or less minority students** | 264 | 5,830 | 16.4% |
| **Minority quartile 2. Schools with 25% to 49.99% minority students** | 368 | 9,316 | 26.2 |
| **Minority quartile 3. Schools with 50% to 74.99% minority students** | 353 | 9,642 | 27.1 |
| **Minority quartile 4. Schools with 75% or more minority students** | 399 | 10,784 | 30.3 |

Source: CBEDS-PAIF

## Part 12: Grade 7–8 Teacher Characteristics by Income and Minority (Non-White) Classifications

This section provides information on the distribution of grade 7–8 teacher qualifications by school classification.. The first set of three tables shows the distribution of teachers by family income. The second set shows the teachers in schools classified by proportion of minority students. The first table in each set shows the distribution of novices, followed by bachelor's degree only teachers, and then not fully credentialed teachers.

### TABLE 43: 7–8 TEACHER PERCENT NOVICES BY STUDENT INCOME QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Income quartile 1. % novice teachers in schools with 7.49% or fewer AFDC eligible students** | 16.0% | n/a | 17.8% | 18.3% |
| **Income quartile 2. % novice teachers in schools with 7.5% to 17.49% AFDC eligible students** | 17.0 | n/a | 18.1 | 19.5 |
| **Income quartile 3. % novice teachers in schools with 17.5% to 29.9% AFDC eligible students** | 19.2 | n/a | 20.0 | 21.6 |
| **Income quartile 4. % novice teachers in schools with 30% or more AFDC eligible students** | 21.9 | n/a | 20.2 | 23.7 |

Source CBEDS-PAIF Note percent novice is not available for 1996–97 due to a large amount of missing data for that year.

### TABLE 44: 7–8 TEACHER PERCENT BACHELOR'S DEGREE ONLY BY STUDENT INCOME QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Income quartile 1. % bachelor's degree only teachers in schools with 7.49% or fewer AFDC eligible students** | 9.6% | 10.0% | 11.0% | 12.3% |
| **Income quartile 2. % bachelor's degree only teachers in schools with 7.5% to 17.49% AFDC eligible students** | 12.8 | 14.0 | 14.6 | 15.6 |
| **Income quartile 3. % bachelor's degree only teachers in schools with 17.5% to 29.9% AFDC eligible students** | 19.1 | 20.1 | 20.1 | 22.8 |
| **Income quartile 4. % bachelor's degree only teachers in schools with 30% or more AFDC eligible students** | 19.9 | 20.1 | 19.9 | 25.3 |

Source CBEDS-PAIF

### TABLE 45–7–8 TEACHER PERCENT NOT FULLY CREDENTIALED BY STUDENT INCOME QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Income quartile 1. % not fully credentialed teachers in schools with 7.49% or fewer AFDC eligible students** | 0.8% | 1.2% | 3.9% | 5.3% |
| **Income quartile 2. % not fully credentialed teachers in schools with 7.5% to 17.49% AFDC eligible students** | 1.4 | 2.7 | 6.6 | 7.9 |
| **Income quartile 3. % not fully credentialed teachers in schools with 17.5% to 29.9% AFDC eligible students** | 2.1 | 3.7 | 9.8 | 11.7 |
| **Income quartile 4. % not fully credentialed teachers in schools with 30% or more AFDC eligible students** | 3.2 | 4.0 | 12.3 | 15.6 |

Source CBEDS-PAIF

### TABLE 46: 7–8 TEACHER PERCENT NOVICES BY STUDENT MINORITY (NON-WHITE) QUARTILES

| | 1995–96 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|
| **Minority quartile 1. % novice teachers in schools with 24.99% or fewer minority students** | 16.7% | 17.5% | 17.1% |
| **Minority quartile 2. % novice teachers in schools with 25% to 49.99% minority students** | 14.8 | 17.2 | 17.9 |
| **Minority quartile 3. % novice teachers in schools with 50% to 74.99% minority students** | 18.2 | 19.3 | 21.3 |
| **Minority quartile 4. % novice teachers in schools with 75% or more minority students** | 21.4 | 20.5 | 23.5 |

Source CBEDS-PAIF Note percent novice is not available for 1996–97 due to a large amount of missing data for that year.

### TABLE 47: 7–8 TEACHER PERCENT BACHELOR'S DEGREE ONLY BY STUDENT MINORITY (NON-WHITE) QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Minority quartile 1. % bachelor's degree only teachers in schools with 24.99% or fewer minority students** | 9.5% | 9.1% | 9.7% | 10.7% |
| **Minority quartile 2. % bachelor's degree only teachers in schools with 25% to 49.99% minority students** | 9.5 | 9.8 | 10.3 | 11.1 |
| **Minority quartile 3. % bachelor's degree only teachers in schools with 50% to 74.99% minority students** | 16.2 | 17.8 | 18.0 | 18.9 |
| **Minority quartile 4. % bachelor's degree only teachers in schools with 75% or more minority students** | 20.6 | 21.6 | 21.9 | 27.2 |

Source CBEDS-PAIF

## TABLE 48: 7–8 TEACHER PERCENT NOT FULLY CREDENTIALED BY STUDENT MINORITY (NON-WHITE) QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Minority quartile 1. % not fully credentialed teachers in schools with 24.99% or fewer minority students** | 0.7% | 1.1% | 3.1% | 3.2% |
| **Minority quartile 2. % not fully credentialed teachers in schools with 25% to 49.99% minority students** | 1.1 | 1.5 | 4.6 | 5.7 |
| **Minority quartile 3. % not fully credentialed teachers in schools with 50% to 74.99% minority students** | 1.5 | 2.7 | 7.0 | 9.3 |
| **Minority quartile 4. % not fully credentialed teachers in schools with 75% or more minority students** | 3.0 | 4.7 | 12.9 | 15.8 |

Source CBEDS-PAIF

## Part 13: Grade 10–12 Teacher Characteristics by Income and Minority (Non-White) Classifications

This section provides information on the distribution of grade 10–12 teacher qualifications by school classification.. The first set of three tables shows the distribution of teachers by family income. The second set shows the teachers in schools classified by proportion of minority students. The first table in each set shows the distribution of novices, followed by bachelor's degree only teachers, and then not fully credentialed teachers.

**TABLE 49: 7–8 TEACHER PERCENT NOVICES BY STUDENT INCOME QUARTILES**

| | 1995–96 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|
| **Income quartile 1. % novice teachers in schools with 7.49% or fewer AFDC eligible students** | 12.0% | 15.3% | 15.9% |
| **Income quartile 2. % novice teachers in schools with 7.5% to 17.49% AFDC eligible students** | 12.6 | 15.7 | 17.0 |
| **Income quartile 3. % novice teachers in schools with 17.5% to 29.9% AFDC eligible students** | 14.9 | 15.4 | 17.8 |
| **Income quartile 4. % novice teachers in schools with 30% or more AFDC eligible students** | 13.0 | 16.4 | 17.9 |

Source CBEDS-PAIF Note percent novice is not available for 1996–97 due to a large amount of missing data for that year.

## TABLE 50: 10–12 TEACHER PERCENT BACHELOR'S DEGREE ONLY BY STUDENT INCOME QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Income quartile 1. % bachelor's degree only teachers in schools with 7.49% or fewer AFDC eligible students** | 8.5% | 9.3% | 10.1% | 10.4% |
| **Income quartile 2. % bachelor's degree only teachers in schools with 7.5% to 17.49% AFDC eligible students** | 11.8 | 13.8 | 14.8 | 17.4 |
| **Income quartile 3. % bachelor's degree only teachers in schools with 17.5% to 29.9% AFDC eligible students** | 15.1 | 16.3 | 17.4 | 20.4 |
| **Income quartile 4. % bachelor's degree only teachers in schools with 30% or more AFDC eligible students** | 12.3 | 13.7 | 15.2 | 18.4 |

Source CBEDS-PAIF

## TABLE 51: 10–12 TEACHER PERCENT NOT FULLY CREDENTIALED BY STUDENT INCOME QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Income quartile 1. % not fully credentialed teachers in schools with 7.49% or fewer AFDC eligible students** | 0.9% | 1.6% | 3.9% | 5.3% |
| **Income quartile 2. % not fully credentialed teachers in schools with 7.5% to 17.49% AFDC eligible students** | 1.3 | 2.5 | 6.0 | 8.0 |
| **Income quartile 3. % not fully credentialed teachers in schools with 17.5% to 29.9% AFDC eligible students** | 1.7 | 3.2 | 8.3 | 10.2 |
| **Income quartile 4. % not fully credentialed teachers in schools with 30% or more AFDC eligible students** | 2.5 | 3.7 | 8.3 | 10.6 |

Source CBEDS-PAIF

## TABLE 52: 10–12 TEACHER PERCENT NOVICES BY STUDENT MINORITY (NON-WHITE) QUARTILES

| | 1995–96 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|
| **Minority quartile 1. % novice teachers in schools with 24.99% or fewer minority students** | 11.6% | 13.7% | 14.0% |
| **Minority quartile 2. % novice teachers in schools with 25% to 49.99% minority students** | 11.5 | 15.8 | 16.0 |
| **Minority quartile 3. % novice teachers in schools with 50% to 74.99% minority students** | 14.2 | 17.1 | 18.7 |
| **Minority quartile 4. % novice teachers in schools with 75% or more minority students** | 13.8 | 15.2 | 17.7 |

Source CBEDS-PAIF Note percent novice is not available for 1996–97 due to a large amount of missing data for that year.

## TABLE 53: 10–12 TEACHER PERCENT BACHELOR'S DEGREE ONLY BY STUDENT MINORITY (NON-WHITE) QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Minority quartile 1. % bachelor's degree only teachers in schools with 24.99% or fewer minority students** | 8.0% | 7.7% | 8.7% | 10.0% |
| **Minority quartile 2. % bachelor's degree only teachers in schools with 25% to 49.99% minority students** | 7.3 | 7.8 | 9.1 | 9.7 |
| **Minority quartile 3. % bachelor's degree only teachers in schools with 50% to 74.99% minority students** | 12.9 | 16.3 | 17.1 | 17.3 |
| **Minority quartile 4. % bachelor's degree only teachers in schools with 75% or more minority students** | 15.7 | 16.7 | 17.6 | 22.5 |

Source CBEDS-PAIF

## TABLE 54: 10–12 TEACHER PERCENT NOT FULLY CREDENTIALED BY STUDENT MINORITY (NON-WHITE) QUARTILES

| | 1995–96 Percent | 1996–97 Percent | 1997–98 Percent | 1998–99 Percent |
|---|---|---|---|---|
| **Minority quartile 1. % not fully credentialed teachers in schools with 24.99% or fewer minority students** | 0.7% | 1.0% | 2.2% | 3.4% |
| **Minority quartile 2. % not fully credentialed teachers in schools with 25% to 49.99% minority students** | 1.0 | 2.0 | 4.6 | 6.0 |
| **Minority quartile 3. % not fully credentialed teachers in schools with 50% to 74.99% minority students** | 1.3 | 2.8 | 6.8 | 8.8 |
| **Minority quartile 4. % not fully credentialed teachers in schools with 75% or more minority students** | 2.2 | 3.5 | 9.1 | 11.3 |

Source CBEDS-PAIF

# APPENDIX 10: TEACHER FLOW REGRESSIONS

This appendix reports on the linked sample and is built around the logistic regressions presented in Chapter 5. For each regression the sample means are reported, followed by the regression results.

## Part 1: Quit Regression

Regression 1

The quit regressions were run on K–3 teachers in 1995–96. There were two regressions run, one for the all K–3 teachers and one for all K–3 teachers under 55 in 1995–96. The dependent variable is one if a teacher left the district between 1995–96 and 1996–97. The first regression is of the teachers under 55 sample (Regression 1) followed by all K–3 teachers (Regression 2).

The dependent variable is 1 in this regression if the teacher quit. There are 37,589 observations in this sample.

## TABLE 1: REGRESSION 1, VARIABLES IN THE TEACHERS UNDER 55 WHO QUIT A DISTRICT BETWEEN 1995–96 AND 1996–97 REGRESSION

| Level | Variables in teacher quit decision: Under 55 sample | Mean | Standard Deviation |
|---|---|---|---|
| Dependent | **Left The District Between 1995–96 And 1996–97** | 0.084919 | 0.278764 |
| County | **Population Density In 1995** | 1340.851 | 2122.048 |
| County | **Average Unemployment 1995** | 8.330948 | 3.59683 |
| County | **Average All Industry Wage 1995** | 28584.8 | 5257.197 |
| County | **Average Federal Wage 1995** | 39006.73 | 5260.207 |
| District | **Total Students** | 18028.36 | 16775.21 |
| District | **Cubed Total Students In 1995–96** | 2.92E+13 | 8.62E+13 |
| District | **Total Schools** | 23.60111 | 21.45404 |
| District | **Total Schools In The District Cubed In 1995–96** | 65270.61 | 200564.2 |
| District | **Maximum District Salary In 1994-95, Merged With 1995–96 Observations** | 51161.85 | 4158.277 |
| District | **District Growth Between 1994-95 And 1995–96, Truncated At +/- 10** | 1.163399 | 2.122351 |
| District | **General Fund Teacher Expenditures Per Student In 1995–96** | 1850.082 | 157.8935 |
| District | **General Fund Administrative Expenditures Per Student In 1995–96** | 195.9971 | 32.57619 |
| School | **Total Students** | 678.6232 | 223.1363 |
| School | **Total Students In School Cubed** | 4.19E+08 | 4.37E+08 |
| School | **School Percent Black In 1995–96** | 7.72186 | 10.30076 |
| School | **School Percent Hispanic In 1995–96** | 37.34228 | 27.54727 |
| School | **School Percent Asian In 1995–96** | 10.12653 | 12.55869 |
| School | **School Percent American Indian In 1995–96** | 0.839395 | 2.70822 |
| School | **School Percent Free Lunch Eligible In 1995–96** | 50.82008 | 28.79721 |
| School | **Class Size** | 29.17056 | 2.939258 |
| School | **School Is Rural** | 0.049988 | 0.217923 |
| School | **School Is Urban** | 0.303147 | 0.459624 |
| Teacher | **Teacher Is Credentialed** | 0.983399 | 0.127771 |
| Teacher | **Female** | 0.920216 | 0.270962 |
| Teacher | **First Year Of Teaching Is 1994-95** | 0.062651 | 0.242338 |
| Teacher | **Novice Teacher, Has 3 Years Or Less Of Total Experience** | 0.174971 | 0.379948 |
| Teacher | **Total Teaching Experience** | 12.45878 | 8.793166 |
| Teacher | **Age** | 40.67709 | 8.996003 |
| Teacher | **Age Squared** | 1735.551 | 716.0945 |
| Teacher | **Age Cubed** | 77005.62 | 44489.69 |
| Teacher | **Has Elementary Subject Authorization** | 0.93248 | 0.250923 |
| Teacher | **Has A Bachelor's Degree Only** | 0.115938 | 0.320155 |
| Teacher | **Education Level Is A Masters Or Higher** | 0.237064 | 0.425288 |
| Teacher | **Teacher Is Asian** | 0.050094 | 0.218143 |
| Teacher | **Teacher Is Black** | 0.02812 | 0.165318 |

| Level | Variables in teacher quit decision: Under 55 sample | Mean | Standard Deviation |
|---|---|---|---|
| Teacher | **Teacher Is Hispanic** | 0.125223 | 0.330976 |
| Teacher | **Teacher Is American Indian** | 0.006039 | 0.077477 |
| Teacher | **Unknown Ethnicity 1995–96** | 0.001277 | 0.035712 |

Source: CBEDS PAIF, CCD, CA EDD, CA DoF, BLS

### TABLE 2: REGRESSION 1 DESCRIPTORS:

| | |
|---|---|
| chi2(36) | 1217.18 |
| Prob > chi2 | 0 |
| Pseudo R2 | 0.0645 |

### TABLE 3: ODDS RATIOS FROM LOGISTIC REGRESSION 1, TEACHERS UNDER 55 QUITTING THER DISTRICT

| Level | Odds Ratio In Quit District Regression: Under 55 Sample | Odds Ratio | Standard Error | Z | P>\|Z\| |
|---|---|---|---|---|---|
| County | **Population Density In 1995** | 1.000037 | 0.000023 | 1.614 | 0.107 |
| County | **Average Unemployment 1995** | 0.988474 | 0.008163 | -1.404 | 0.16 |
| County | **Average All Industry Wage 1995** | 1.000018 | 8.29E-06 | 2.229 | 0.026 |
| County | **Average Federal Wage 1995** | 1.000004 | 6.40E-06 | 0.652 | 0.514 |
| District | **Total Students** | 1.00001 | 8.99E-06 | 1.116 | 0.265 |
| District | **Cubed Total Students In 1995–96** | 1 | 7.82E-16 | 1.016 | 0.309 |
| District | **Total Schools** | 0.991858 | 0.007288 | -1.113 | 0.266 |
| District | **Total Schools In The District Cubed In 1995–96** | 0.999999 | 4.96E-07 | -1.366 | 0.172 |
| District | **Maximum District Salary In 1994-95, Merged With 1995–96 Observations** | 0.999957 | 7.67E-06 | -5.668 | 0 |
| District | **District Growth Between 1994-95 And 1995–96, Truncated At +/- 10** | 0.995692 | 0.011193 | -0.384 | 0.701 |
| District | **General Fund Teacher Expenditures Per Student In 1995–96** | 0.999656 | 0.000169 | -2.034 | 0.042 |
| District | **General Fund Administrative Expenditures Per Student In 1995–96** | 1.002624 | 0.000875 | 3.004 | 0.003 |
| School | **Total Students** | 1.000386 | 0.000245 | 1.578 | 0.115 |
| School | **Total Students In School Cubed** | 1 | 1.09E-10 | -1.722 | 0.085 |
| School | **School Percent Black In 1995–96** | 1.013448 | 0.002398 | 5.647 | 0 |
| School | **School Percent Hispanic In 1995–96** | 1.004927 | 0.001591 | 3.104 | 0.002 |
| School | **School Percent Asian In 1995–96** | 0.999842 | 0.002145 | -0.074 | 0.941 |
| School | **School Percent American Indian In 1995–96** | 1.004403 | 0.007803 | 0.565 | 0.572 |
| School | **School Percent Free Lunch Eligible In 1995–96** | 0.99872 | 0.001443 | -0.886 | 0.375 |
| School | **Class Size** | 0.985087 | 0.007126 | -2.077 | 0.038 |
| School | **School Is Rural** | 1.107139 | 0.11224 | 1.004 | 0.315 |
| School | **School Is Urban** | 0.918761 | 0.048264 | -1.613 | 0.107 |
| Teacher | **Teacher Is Credentialed** | 0.693306 | 0.076899 | -3.302 | 0.001 |
| Teacher | **Female** | 0.861618 | 0.056469 | -2.273 | 0.023 |
| Teacher | **First Year Of Teaching Is 1994-95** | 1.152205 | 0.086041 | 1.897 | 0.058 |
| Teacher | **Novice Teacher, Has 3 Years Or Less Of Total Experience** | 1.164496 | 0.073437 | 2.415 | 0.016 |
| Teacher | **Total Teaching Experience** | 0.968554 | 0.004224 | -7.326 | 0 |
| Teacher | **Age** | 2.778001 | 0.387752 | 7.32 | 0 |
| Teacher | **Age Squared** | 0.9714 | 0.003557 | -7.924 | 0 |
| Teacher | **Age Cubed** | 1.000257 | 3.12E-05 | 8.24 | 0 |
| Teacher | **Has Elementary Subject Authorization** | 0.976452 | 0.072718 | -0.32 | 0.749 |

| Level | Odds Ratio In Quit District Regression: Under 55 Sample | Odds Ratio | Standard Error | Z | P>\|Z\| |
|---|---|---|---|---|---|
| Teacher | **Has A Bachelor's Degree Only** | 1.161753 | 0.065878 | 2.644 | 0.008 |
| Teacher | **Education Level Is A Masters Or Higher** | 1.260182 | 0.062875 | 4.635 | 0 |
| Teacher | **Teacher Is Asian** | 0.92444 | 0.086386 | -0.841 | 0.4 |
| Teacher | **Teacher Is Black** | 1.04971 | 0.11393 | 0.447 | 0.655 |
| Teacher | **Teacher Is Hispanic** | 0.891895 | 0.054761 | -1.863 | 0.062 |
| Teacher | **Teacher Is American Indian** | 1.786638 | 0.366375 | 2.83 | 0.005 |
| Teacher | **Unknown Ethnicity 1995–96** | 2.79448 | 0.940721 | 3.053 | 0.002 |

Source: CBEDS PAIF, CCD, CA EDD, CA DoF, BLS

Regression 2

All Teachers who quit a district between 1995–96 and 1996–97

The dependent variable is one if a teacher was not teaching in a district after the 1995–96 school year. There are 42,069 observations in this sample.

## TABLE 4: VARIABLES IN REGRESSION 2ALL TEACHERS WHO QUIT A DISTRICT BETWEEN 1995–96 AND 1996–97

| Level | Variables In Teacher Quit Decision: All K–3 Teachers Sample | Mean | Standard Deviation |
|---|---|---|---|
| Dependent | **Left The District Between 1995–96 And 1996–97** | 0.0942262 | 0.2921466 |
| County | **Population Density In 1995** | 1367.534 | 2151.06 |
| County | **Average Unemployment 1995** | 8.288288 | 3.578909 |
| County | **Average All Industry Wage 1995** | 28699.11 | 5282.569 |
| County | **Average Federal Wage 1995** | 39074.77 | 5263.853 |
| District | **Total Students** | 18098.75 | 16778.45 |
| District | **Cubed Total Students In 1995–96** | 2.92E+13 | 8.57E+13 |
| District | **Total Schools** | 23.83351 | 21.68024 |
| District | **Total Schools In The District Cubed In 1995–96** | 67099.72 | 203933 |
| District | **Maximum District Salary In 1994-95, Merged With 1995–96 Observations** | 51116.6 | 4122.44 |
| District | **District Growth Between 1994-95 And 1995–96, Truncated At +/- 10** | 1.146474 | 2.101344 |
| District | **General Fund Teacher Expenditures Per Student In 1995–96** | 1851.388 | 158.9768 |
| District | **General Fund Administrative Expenditures Per Student In 1995–96** | 196.1988 | 32.6161 |
| School | **Total Students** | 675.0274 | 222.5945 |
| School | **Total Students In School Cubed** | 4.13E+08 | 4.36E+08 |
| School | **School Percent Black In 1995–96** | 7.770853 | 10.39837 |
| School | **School Percent Hispanic In 1995–96** | 37.20528 | 27.54427 |
| School | **School Percent Asian In 1995–96** | 10.2954 | 12.71666 |
| School | **School Percent American Indian In 1995–96** | 0.8468231 | 2.79966 |
| School | **School Percent Free Lunch Eligible In 1995–96** | 50.76246 | 28.81923 |
| School | **Class Size** | 29.17723 | 2.936884 |
| School | **School Is Rural** | 0.0485393 | 0.2149054 |
| School | **School Is Urban** | 0.3032875 | 0.4596838 |
| Teacher | **Teacher Is Credentialed** | 0.9850721 | 0.1212657 |
| Teacher | **Female** | 0.9230788 | 0.2664696 |
| Teacher | **First Year Of Teaching Is 1994-95** | 0.0561934 | 0.2302975 |
| Teacher | **Novice Teacher, Has 3 Years Or Less Of Total Experience** | 0.1568851 | 0.3636967 |
| Teacher | **Total Teaching Experience** | 13.9806 | 9.835325 |
| Teacher | **Age** | 42.66531 | 10.3244 |
| Teacher | **Age Squared** | 1926.92 | 884.5301 |
| Teacher | **Age Cubed** | 91268.34 | 60179.21 |
| Teacher | **Has Elementary Subject Authorization** | 0.9347976 | 0.2468856 |
| Teacher | **Has A Bachelor's Degree Only** | 0.1119114 | 0.3152611 |
| Teacher | **Education Level Is A Masters Or Higher** | 0.249067 | 0.4324778 |
| Teacher | **Teacher Is Asian** | 0.0502508 | 0.2184646 |
| Teacher | **Teacher Is Black** | 0.0317098 | 0.1752285 |

| Level | Variables In Teacher Quit Decision: All K–3 Teachers Sample | Mean | Standard Deviation |
|---|---|---|---|
| Teacher | **Teacher Is Hispanic** | 0.1188761 | 0.3236465 |
| Teacher | **Teacher Is American Indian** | 0.0062041 | 0.0785223 |
| Teacher | **Unknown Ethnicity 1995–96** | 0.0012361 | 0.0351364 |

Source: CBEDS PAIF, CCD, CA EDD, CA DoF, BLS

## TABLE 5: REGRESSION 2 DESCRIPTORS

| | |
|---|---|
| chi2(36) | 1334.61 |
| Prob > chi2 | 0 |
| Pseudo R2 | 0.0559 |

## TABLE 6: ODDS RATIOS FROM LOGISTIC REGRESSION 2, ALL K–3 TEACHERS QUITTING THEIR DISTRICT

| Level | Odds Ratios From Quit Decision: All K–3 Teachers Sample | Odds Ratio | Standard Error. | Z | P>\|Z\| |
|---|---|---|---|---|---|
| County | **Population Density In 1995** | 0.999986 | 2.05E-05 | -0.698 | 0.485 |
| County | **Average Unemployment 1995** | 1.001543 | 0.007675 | 0.201 | 0.841 |
| County | **Average All Industry Wage 1995** | 1.000033 | 7.27E-06 | 4.607 | 0 |
| County | **Average Federal Wage 1995** | 0.999998 | 5.70E-06 | -0.44 | 0.66 |
| District | **Total Students** | 1.000014 | 8.01E-06 | 1.762 | 0.078 |
| District | **Cubed Total Students In 1995–96** | 1 | 7.14E-16 | -0.334 | 0.739 |
| District | **Total Schools** | 0.990871 | 0.006398 | -1.42 | 0.155 |
| District | **Total Schools In The District Cubed In 1995–96** | 1 | 4.43E-07 | -0.097 | 0.923 |
| District | **Maximum District Salary In 1994-95, Merged With 1995–96 Observations** | 0.999967 | 6.90E-06 | -4.799 | 0 |
| District | **District Growth Between 1994-95 And 1995–96, Truncated At +/- 10** | 0.994138 | 0.010088 | -0.579 | 0.562 |
| District | **General Fund Teacher Expenditures Per Student In 1995–96** | 0.999708 | 0.000147 | -1.981 | 0.048 |
| District | **General Fund Administrative Expenditures Per Student In 1995–96** | 1.002132 | 0.000792 | 2.695 | 0.007 |
| School | **Total Students** | 1.000161 | 0.000213 | 0.757 | 0.449 |
| School | **Total Students In School Cubed** | 1 | 9.33E-11 | -1.009 | 0.313 |
| School | **School Percent Black In 1995–96** | 1.01044 | 0.002226 | 4.715 | 0 |
| School | **School Percent Hispanic In 1995–96** | 1.004163 | 0.001447 | 2.883 | 0.004 |
| School | **School Percent Asian In 1995–96** | 0.999216 | 0.001879 | -0.417 | 0.677 |
| School | **School Percent American Indian In 1995–96** | 1.005787 | 0.006662 | 0.871 | 0.384 |
| School | **School Percent Free Lunch Eligible In 1995–96** | 0.998156 | 0.0013 | -1.417 | 0.156 |
| School | **Class Size** | 0.983618 | 0.006467 | -2.512 | 0.012 |
| School | **School Is Rural** | 1.075479 | 0.097946 | 0.799 | 0.424 |
| School | **School Is Urban** | 0.921858 | 0.043753 | -1.714 | 0.086 |
| Teacher | **Teacher Is Credentialed** | 0.649743 | 0.072636 | -3.857 | 0 |
| Teacher | **Female** | 0.845073 | 0.051455 | -2.765 | 0.006 |
| Teacher | **First Year Of Teaching Is 1994-95** | 1.092214 | 0.081441 | 1.183 | 0.237 |
| Teacher | **Novice Teacher, Has 3 Years Or Less Of Total Experience** | 1.258659 | 0.08003 | 3.618 | 0 |
| Teacher | **Total Teaching Experience** | 0.993166 | 0.003174 | -2.146 | 0.032 |
| Teacher | **Age** | 1.259895 | 0.091934 | 3.166 | 0.002 |
| Teacher | **Age Squared** | 0.990948 | 0.001692 | -5.327 | 0 |
| Teacher | **Age Cubed** | 1.000094 | 1.28E-05 | 7.377 | 0 |
| Teacher | **Has Elementary Subject Authorization** | 0.963295 | 0.066641 | -0.541 | 0.589 |

| Level | Odds Ratios From Quit Decision: All K–3 Teachers Sample | Odds Ratio | Standard Error. | Z | P>\|Z\| |
|---|---|---|---|---|---|
| Teacher | **Has A Bachelor's Degree Only** | 1.16977 | 0.063284 | 2.898 | 0.004 |
| Teacher | **Education Level Is A Masters Or Higher** | 1.129572 | 0.049884 | 2.759 | 0.006 |
| Teacher | **Teacher Is Asian** | 0.852372 | 0.07411 | -1.837 | 0.066 |
| Teacher | **Teacher Is Black** | 0.931072 | 0.091812 | -0.724 | 0.469 |
| Teacher | **Teacher Is Hispanic** | 0.876632 | 0.051158 | -2.256 | 0.024 |
| Teacher | **Teacher Is American Indian** | 1.601192 | 0.290584 | 2.594 | 0.009 |
| Teacher | **Unknown Ethnicity 1995–96** | 2.625804 | 0.849676 | 2.983 | 0.003 |

Source: CBEDS PAIF, CCD, CA EDD, CA DoF, BLS

## Part 2: Transfer Regressions

There are two transfer regressions. The first is of teachers who left schools in 1995–96 (Regression 3). The second is of teachers who arrived in schools in 1996–97 (regression 4). Both regressions contain the same variables, but each has a slightly different sample.

Regression 3: Teachers that left schools after 1995–96
The dependent variable is one if the teacher left the school after the 1995–96 school year. There are 37,398 observations in this sample.

## TABLE 7: VARIABLES IN REGRESSION 3, TEACHERS TRANSFERRING OUT OF SCHOOLS IN 1995–96

| Level | Variables In The Teacher Transfer Regression: Sample Of Those Who Left Schools In 1995-6 | Mean | Standard Deviation |
|---|---|---|---|
| Dependent | **Change Schools Within A District** | 0.0443339 | 0.2058387 |
| County | **Population Density In 1995** | 1350.881 | 2128.09 |
| County | **Average Unemployment 1995** | 8.304054 | 3.597 |
| County | **Average All Industry Wage 1995** | 28631.57 | 5269.956 |
| County | **Average Federal Wage 1995** | 39027.47 | 5264.058 |
| District | **Total Schools** | 23.68667 | 21.52337 |
| District | **Total Schools In The District Cubed In 1995-6** | 65841.49 | 201337.1 |
| District | **Total Students** | 17973.18 | 16627.14 |
| District | **Cubed Total Students In 1995-6** | 2.85E+13 | 8.40E+13 |
| District | **District Growth Between 1994-95 And 1995-6, Truncated At +/- 10** | 1.146104 | 2.103009 |
| District | **Maximum District Salary In 1994-95, Merged With 1995-6 Observations** | 51141.25 | 4137.893 |
| District | **General Fund Teacher Expenditures Per Student In 1995-6** | 1852.964 | 158.4376 |
| District | **General Fund Administrative Expenditures Per Student In 1995-6** | 196.0112 | 32.24702 |
| School 95-6 | **Total Students** | 675.0124 | 222.3161 |
| School 95-6 | **Total Students In School Cubed** | 4.13E+08 | 4.37E+08 |
| School 95-6 | **School Percent Black In 1995-6** | 7.569389 | 10.15168 |
| School 95-6 | **School Percent Hispanic In 1995-6** | 36.81635 | 27.49972 |
| School 95-6 | **School Percent Asian In 1995-6** | 10.29649 | 12.72517 |
| School 95-6 | **School Percent American Indian In 1995-6** | 0.8480667 | 2.730414 |
| School 95-6l | **School Percent Free Lunch Eligible In 1995-6** | 50.22504 | 28.78968 |
| School 95-6 | **Class Size** | 29.19477 | 2.908574 |
| School 95-6 | **School Is Rural** | 0.0489598 | 0.215787 |
| School 95-6 | **School Is Urban** | 0.3030109 | 0.459566 |
| School 96-7 | **Total Students** | 684.5401 | 231.9821 |
| School 96-7 | **Total Students In School Cubed** | 4.40E+08 | 5.68E+08 |
| School 96-7 | **School Percent Black In 1996-7** | 7.578908 | 10.07929 |
| School 96-7 | **School Percent Hispanic In 1996-7** | 37.80796 | 27.83779 |
| School 96-7 | **School Percent Asian In 1996-7** | 10.31646 | 12.88056 |
| School 96-7 | **School Percent American Indian In 1996-7** | 0.851222 | 2.625446 |
| School 96-7 | **Percent Free Lunch Eligible Students In The School** | 50.67557 | 29.24709 |
| School 96-7 | **Reduced In Teacher's Grade** | 0.3211134 | 0.4669105 |
| School 96-7 | **Reduced Grade Interacted With Percent Hispanic Students** | 9.847853 | 20.44338 |
| School 96-7 | **Reduced Grade Interacted With Percent Asian Students** | 3.47786 | 9.211609 |
| School 96-7 | **Reduced Grade Interacted With School Percent American Indian** | 0.2973956 | 1.348913 |
| School 96-7 | **Reduced Grade Interacted With Percent Black Students** | 2.300658 | 6.511624 |

| Level | Variables In The Teacher Transfer Regression: Sample Of Those Who Left Schools In 1995-6 | Mean | Standard Deviation |
|---|---|---|---|
| School 96-7 | **Reduced Grade Interacted With School Percent Free Lunch Eligible Students** | 14.68568 | 26.94962 |
| School 96-7 | **Class Size** | 25.88467 | 6.148099 |
| School 96-7 | **School Is Rural** | 0.0487994 | 0.2154513 |
| School 96-7 | **School Is Urban** | 0.3030109 | 0.459566 |
| Teacher | **Female** | 0.924996 | 0.2634013 |
| Teacher | **First Year Of Teaching Is 1994-95** | 0.0508851 | 0.219766 |
| Teacher | **Novice Teacher, Has 3 Years Or Less Of Total Experience** | 0.1455425 | 0.3526517 |
| Teacher | **Total Teaching Experience** | 14.1749 | 9.673623 |
| Teacher | **Age** | 42.88157 | 10.03294 |
| Teacher | **Age Squared** | 1939.486 | 857.3241 |
| Teacher | **Age Cubed** | 91699.05 | 58080.67 |
| Teacher | **Teacher Is Credentialed** | 0.9877801 | 0.1098677 |
| Teacher | **Has A Bachelor's Degree Only** | 0.1061019 | 0.3079722 |
| Teacher | **Education Level Is A Masters Or Higher** | 0.2487299 | 0.4322827 |
| Teacher | **Teacher Is Black** | 0.0300551 | 0.1707412 |
| Teacher | **Teacher Is Hispanic** | 0.1167442 | 0.3211195 |
| Teacher | **Teacher Is Asian** | 0.0505375 | 0.2190541 |
| Teacher | **Teacher Is American Indian** | 0.0058559 | 0.0763007 |
| Teacher | **Unknown Ethnicity 1995-6** | 0.0009894 | 0.0314389 |

Source: CBEDS PAIF, CCD, CA EDD, CA DoF, BLS

## TABLE 8: REGRESSION 3 DESCRIPTORS:

| | |
|---|---|
| chi2(36) | 608.13 |
| Prob > chi2 | 0 |
| Pseudo R2 | 0.1472 |

## TABLE 9: ODDS RATIOS FROM LOGISTIC REGRESSION 3, TEACHER TRANSFERS OUT OF SCHOOLS 1995-6

| Level | Odds Ratios In Teachers Transfers, Teachers Who Left In 1995-6 | Odds Ratio | Standard Error | Z | P>\|Z\| |
|---|---|---|---|---|---|
| County | **Population Density In 1995** | 0.999936 | 3.62E-05 | -1.76 | 0.078 |
| County | **Average Unemployment 1995** | 1.019722 | 0.012865 | 1.548 | 0.122 |
| County | **Average All Industry Wage 1995** | 0.99999 | 1.27E-05 | -0.773 | 0.439 |
| County | **Average Federal Wage 1995** | 1.000025 | 9.22E-06 | 2.682 | 0.007 |
| District | **Total Schools** | 1.016143 | 0.011425 | 1.424 | 0.154 |
| District | **Total Schools In The District Cubed In 1995-6** | 1 | 7.58E-07 | -0.58 | 0.562 |
| District | **Total Students** | 0.999998 | 1.42E-05 | -0.149 | 0.881 |
| District | **Cubed Total Students In 1995-6** | 1 | 1.18E-15 | -0.755 | 0.451 |
| District | **District Growth Between 1994-95 And 1995-6, Truncated At +/- 10** | 0.992095 | 0.019327 | -0.407 | 0.684 |
| District | **Maximum District Salary In 1994-95, Merged With 1995-6 Observations** | 1.000021 | 1.01E-05 | 2.103 | 0.035 |
| District | **General Fund Teacher Expenditures Per Student In 1995-6** | 0.999302 | 0.000248 | -2.816 | 0.005 |
| District | **General Fund Administrative Expenditures Per Student In 1995-6** | 1.000805 | 0.001288 | 0.625 | 0.532 |
| School 95-6 | **Total Students** | 1.007839 | 0.001512 | 5.206 | 0 |
| School 95-6 | **Total Students In School Cubed** | 1 | 7.43E-10 | -3.842 | 0 |
| School 95-6 | **School Percent Black In 1995-6** | 1.132663 | 0.021624 | 6.525 | 0 |
| School 95-6 | **School Percent Hispanic In 1995-6** | 1.07957 | 0.012786 | 6.465 | 0 |
| School 95-6 | **School Percent Asian In 1995-6** | 0.985743 | 0.023186 | -0.61 | 0.542 |
| School 95-6 | **School Percent American Indian In 1995-6** | 1.032017 | 0.024624 | 1.321 | 0.187 |
| School 95-6 | **School Percent Free Lunch Eligible In 1995-6** | 1.020956 | 0.004267 | 4.962 | 0 |
| School 95-6 | **Class Size** | 0.995718 | 0.010483 | -0.408 | 0.684 |
| School 95-6 | **School Is Rural** | 102.4582 | 135.2557 | 3.507 | 0 |
| School 95-6 | **School Is Urban** | 1.228275 | 1.166154 | 0.217 | 0.829 |
| School 96-7 | **Total Students** | 0.991913 | 0.001319 | -6.105 | 0 |
| School 96-7 | **Total Students In School Cubed** | 1 | 6.06E-10 | 4.524 | 0 |
| School 96-7 | **School Percent Black In 1996-7** | 0.880873 | 0.017801 | -6.277 | 0 |
| School 96-7 | **School Percent Hispanic In 1996-7** | 0.925073 | 0.010835 | -6.65 | 0 |
| School 96-7 | **School Percent Asian In 1996-7** | 1.005772 | 0.023126 | 0.25 | 0.802 |
| School 96-7 | **School Percent American Indian In 1996-7** | 0.951068 | 0.032122 | -1.485 | 0.137 |
| School 96-7 | **Percent Free Lunch Eligible Students In The School** | 0.983125 | 0.003417 | -4.896 | 0 |

| Level | Odds Ratios In Teachers Transfers, Teachers Who Left In 1995-6 | Odds Ratio | Standard Error | Z | P>\|Z\| |
|---|---|---|---|---|---|
| School 96-7 | **Reduced In Teacher's Grade** | 0.955385 | 0.155291 | -0.281 | 0.779 |
| School 96-7 | **Reduced Grade Interacted With Percent Hispanic Students** | 1.000541 | 0.003914 | 0.138 | 0.89 |
| School 96-7 | **Reduced Grade Interacted With Percent Asian Students** | 1.004689 | 0.004811 | 0.977 | 0.329 |
| School 96-7 | **Reduced Grade Interacted With School Percent American Indian** | 0.962554 | 0.048885 | -0.751 | 0.452 |
| School 96-7 | **Reduced Grade Interacted With Percent Black Students** | 0.993984 | 0.006676 | -0.898 | 0.369 |
| School 96-7 | **Reduced Grade Interacted With School Percent Free Lunch Eligible Students** | 0.998717 | 0.003533 | -0.363 | 0.717 |
| School 96-7 | **Class Size** | 0.989793 | 0.009059 | -1.121 | 0.262 |
| School 96-7 | **School Is Rural** | 0.006042 | 0.008149 | -3.788 | 0 |
| School 96-7 | **School Is Urban** | 1.028988 | 0.972146 | 0.03 | 0.976 |
| Teacher | **Female** | 0.983437 | 0.090258 | -0.182 | 0.856 |
| Teacher | **First Year Of Teaching Is 1994-95** | 1.353467 | 0.164313 | 2.493 | 0.013 |
| Teacher | **Novice Teacher, Has 3 Years Or Less Of Total Experience** | 1.031067 | 0.099213 | 0.318 | 0.751 |
| Teacher | **Total Teaching Experience** | 0.975425 | 0.00494 | -4.913 | 0 |
| Teacher | **Age** | 1.303929 | 0.163798 | 2.113 | 0.035 |
| Teacher | **Age Squared** | 0.994084 | 0.002984 | -1.976 | 0.048 |
| Teacher | **Age Cubed** | 1.00004 | 2.32E-05 | 1.711 | 0.087 |
| Teacher | **Teacher Is Credentialed** | 0.695063 | 0.127772 | -1.979 | 0.048 |
| Teacher | **Has A Bachelor's Degree Only** | 1.007367 | 0.090377 | 0.082 | 0.935 |
| Teacher | **Education Level Is A Masters Or Higher** | 1.264121 | 0.079212 | 3.74 | 0 |
| Teacher | **Teacher Is Black** | 0.916445 | 0.158321 | -0.505 | 0.614 |
| Teacher | **Teacher Is Hispanic** | 0.880227 | 0.077082 | -1.457 | 0.145 |
| Teacher | **Teacher Is Asian** | 0.950706 | 0.117478 | -0.409 | 0.682 |
| Teacher | **Teacher Is American Indian** | 1.351106 | 0.403994 | 1.006 | 0.314 |
| Teacher | **Unknown Ethnicity 1995-6** | 3.387233 | 1.754194 | 2.356 | 0.018 |

Source: CBEDS PAIF, CCD, CA EDD, CA DoF, BLS

Regression 4: Teachers that arrived in schools in 1996-7
The dependent variable is one if the teacher was in a different school in the prior year.
There are 37,909 observations in this sample.

## TABLE 10: VARIABLES IN REGRESSION 4, TEACHERS TRANSFERRING INTO SCHOOLS IN 1996–97

| Level | Variables In The Teacher Transfer Regression: Sample Is Those Who Arrived In Schools In 1996-7 | Mean | Standard Deviation |
|---|---|---|---|
| Dependent | **Change Schools Within The Same District** | 0.0450816 | 0.207486 |
| County | **Population Density In 1995** | 1365.635 | 2183.753 |
| County | **Average Unemployment 1995** | 8.315651 | 3.617942 |
| County | **Average All Industry Wage 1995** | 28633.47 | 5289.58 |
| County | **Average Federal Wage 1995** | 39012.78 | 5278.207 |
| District | **Total Schools** | 23.75272 | 21.75635 |
| District | **Total Schools In District Cubed** | 67494.04 | 206347.4 |
| District | **Total Students** | 17964.74 | 16681.63 |
| District | **Cubed Total Students In 1995-6** | 2.87E+13 | 8.42E+13 |
| District | **Growth Between 1994-95 And 1995-6, Truncated At +/- 10** | 1.144187 | 2.108022 |
| District | **Maximum District Salary In 1994-95, Merged With 1995-6 Observations** | 51100.95 | 4126.817 |
| District | **General Fund Teacher Expenditures Per Student In 1995-6** | 1853.079 | 158.0543 |
| District | **General Fund Administrative Expenditures Per Student In 1995-6** | 196.1489 | 32.08268 |
| School 95-6 | **Total Students** | 673.6202 | 222.2175 |
| School 95-6 | **Total Students In School Cubed** | 4.11E+08 | 4.68E+08 |
| School 95-6 | **School Percent Black In 1995-6** | 7.572925 | 10.1554 |
| School 95-6 | **School Percent Hispanic In 1995-6** | 36.68448 | 27.44024 |
| School 95-6 | **School Percent Asian In 1995-6** | 10.34459 | 12.78558 |
| School 95-6 | **School Percent American Indian In 1995-6** | 0.8515392 | 2.668923 |
| School 95-6l | **School Percent Free Lunch Eligible In 1995-6** | 50.22966 | 28.7701 |
| School 95-6 | **Class Size** | 29.34646 | 5.956889 |
| School 95-6 | **School Is Rural** | 0.0495661 | 0.2170496 |
| School 95-6 | **School Is Urban** | 0.3054684 | 0.4606116 |
| School 96-7 | **Total Students** | 681.3456 | 226.9043 |
| School 96-7 | **Total Students In School Cubed** | 4.28E+08 | 4.67E+08 |
| School 96-7 | **School Percent Black In 1996-7** | 7.579519 | 10.06376 |
| School 96-7 | **School Percent Hispanic in 1996-7** | 37.65876 | 27.78132 |
| School 96-7 | **School Percent Asian In 1996-7** | 10.36825 | 12.95561 |
| School 96-7 | **School Percent American Indian In 1995-6** | 0.85605 | 2.579226 |
| School 96-7 | **Percent Free Lunch Eligible Students In The School** | 50.69408 | 29.22674 |
| School 96-7 | **Reduced In Teacher's Grade** | 0.3367802 | 0.4726153 |
| School 96-7 | **Reduced Grade Interacted With Percent Hispanic Students** | 10.36704 | 20.88807 |
| School 96-7 | **Reduced Grade Interacted With Percent Asian Students** | 3.60334 | 9.311052 |
| School 96-7 | **Reduced Grade Interacted With School Percent American Indian** | 0.3099792 | 1.242923 |
| School 96-7 | **Reduced Grade Interacted With Percent Black Students** | 2.387744 | 6.591131 |

| Level | Variables In The Teacher Transfer Regression: Sample Is Those Who Arrived In Schools In 1996-7 | Mean | Standard Deviation |
|---|---|---|---|
| School 96-7 | **Reduced Grade Interacted With Percent Free Lunch Eligible Students** | 14.7538 | 27.00618 |
| School 96-7 | **Class Size** | 25.72769 | 5.321092 |
| School 96-7 | **School Is Rural** | 0.0495924 | 0.2171043 |
| School 96-7 | **School Is Urban** | 0.3054156 | 0.4605893 |
| Teacher | **Female** | 0.9251629 | 0.2631318 |
| Teacher | **First Year Of Teaching Is 1994-95** | 0.0513335 | 0.2206799 |
| Teacher | **Novice Teacher, Has 3 Years Or Less Of Total Experience** | 0.145691 | 0.3528008 |
| Teacher | **Total Teaching Experience** | 14.18476 | 9.665826 |
| Teacher | **Age** | 42.90282 | 10.01804 |
| Teacher | **Age Squared** | 1941.01 | 855.7576 |
| Teacher | **Age Cubed** | 91777.33 | 57954.83 |
| Teacher | **Teacher Is Credentialed** | 0.9882877 | 0.107589 |
| Teacher | **Has A Bachelor's Degree Only** | 0.1045662 | 0.3059977 |
| Teacher | **Education Level Is A Masters Or Higher** | 0.2483315 | 0.4320508 |
| Teacher | **Teacher Is Black** | 0.0294653 | 0.169109 |
| Teacher | **Teacher Is Hispanic** | 0.1163048 | 0.3205943 |
| Teacher | **Teacher Is Asian** | 0.0503838 | 0.2187385 |
| Teacher | **Teacher Is American Indian** | 0.0057506 | 0.0756154 |
| Teacher | **Unknown Teacher Ethnicity** | 0.000976 | 0.0312265 |

Source: CBEDS PAIF, CCD, CA EDD, CA DoF, BLS

**TABLE 11: REGRESSION 4 DESCRIPTORS:**

| | |
|---|---|
| chi2(36) | 615.82 |
| Prob > chi2 | 0 |
| Pseudo R2 | 0.1405 |

**TABLE 12: VARIABLES IN REGRESSION 4, TEACHERS TRANSFERRING OUT OF SCHOOLS IN 1995–96**

| Level | Odds Ratios In Teachers Transfers, Teachers Who Arrive in 1996-7 | Odds Ratio | Standard Error | z | P>\|z\| |
|---|---|---|---|---|---|
| County | Population Density In 1995 | 0.99995 | 3.6E-05 | -1.504 | 0.132 |
| County | Average Unemployment 1995 | 1.02199 | 0.0184 | 1.208 | 0.227 |
| County | Average All Industry Wage 1995 | 1 | 1.5E-05 | -0.314 | 0.754 |
| County | Average Federal Wage 1995 | 1.00001 | 1.3E-05 | 0.984 | 0.325 |
| District | Total Schools | 1.01883 | 0.01344 | 1.414 | 0.157 |
| District | Total Schools In District Cubed | 1 | 7.61E-07 | -0.929 | 0.353 |
| District | Total Students | 1 | 1.8E-05 | -0.265 | 0.791 |
| District | Cubed Total Students In 1995-6 | 1 | 1.35E-15 | -0.757 | 0.449 |
| District | Growth Between 1994-95 And 1995-6, Truncated At +/- 10 | 1.0075 | 0.02612 | 0.288 | 0.773 |
| District | Maximum District Salary In 1994-95, Merged With 1995-6 Observations | 1.00002 | 1.3E-05 | 1.521 | 0.128 |
| District | General Fund Teacher Expenditures Per Student In 1995-6 | 0.99945 | 0.00028 | -1.976 | 0.048 |
| District | General Fund Administrative Expenditures Per Student In 1995-6 | 0.9994 | 0.00154 | -0.391 | 0.696 |
| School 95-6 | Total Students | 1.00385 | 0.00104 | 3.7 | 0 |
| School 95-6 | Total Students In School Cubed | 1 | 2.03E-10 | -0.299 | 0.765 |
| School 95-6 | School Percent Black In 1995-6 | 1.12753 | 0.02006 | 6.746 | 0 |
| School 95-6 | School Percent Hispanic In 1995-6 | 1.08122 | 0.01285 | 6.573 | 0 |
| School 95-6 | School Percent Asian In 1995-6 | 0.98463 | 0.02275 | -0.67 | 0.503 |
| School 95-6 | School Percent American Indian In 1995-6 | 1.05147 | 0.02805 | 1.881 | 0.06 |
| School 95-6 | School Percent Free Lunch Eligible In 1995-6 | 1.01911 | 0.00507 | 3.801 | 0 |
| School 95-6 | Class Size | 1.00272 | 0.00499 | 0.547 | 0.584 |
| School 95-6 | School Is Rural | 2.17552 | 7.57598 | 0.223 | 0.823 |
| School 95-6 | School Is Urban | 1.36673 | 1.41784 | 0.301 | 0.763 |
| School 96-7 | Total Students | 0.99517 | 0.00101 | -4.776 | 0 |
| School 96-7 | Total Students In School Cubed | 1 | 2.29E-10 | 2.152 | 0.031 |
| School 96-7 | School Percent Black In 1996-7 | 0.88855 | 0.01649 | -6.367 | 0 |
| School 96-7 | School Percent Hispanic in 1996-7 | 0.9245 | 0.0107 | -6.783 | 0 |
| School 96-7 | School Percent Asian In 1996-7 | 1.00618 | 0.02218 | 0.28 | 0.78 |
| School 96-7 | School Percent American Indian In 1995-6 | 0.9526 | 0.03149 | -1.469 | 0.142 |
| School 96-7 | Percent Free Lunch Eligible Students In The School | 0.98448 | 0.00386 | -3.985 | 0 |
| School 96-7 | Reduced In Teacher's Grade | 1.31387 | 0.21244 | 1.688 | 0.091 |

| Level | Odds Ratios In Teachers Transfers, Teachers Who Arrive in 1996-7 | Odds Ratio | Standard Error | z | P>\|z\| |
|---|---|---|---|---|---|
| School 96-7 | **Reduced Grade Interacted With Percent Hispanic Students** | 1.00035 | 0.00368 | 0.094 | 0.925 |
| School 96-7 | **Reduced Grade Interacted With Percent Asian Students** | 1.00635 | 0.00407 | 1.564 | 0.118 |
| School 96-7 | **Reduced Grade Interacted With School Percent American Indian** | 0.97328 | 0.0405 | -0.651 | 0.515 |
| School 96-7 | **Reduced Grade Interacted With Percent Black Students** | 0.98556 | 0.00635 | -2.258 | 0.024 |
| School 96-7 | **Reduced Grade Interacted With Percent Free Lunch Eligible Students** | 0.99769 | 0.00328 | -0.703 | 0.482 |
| School 96-7 | **Class Size** | 0.9816 | 0.01055 | -1.727 | 0.084 |
| School 96-7 | **School Is Rural** | 0.36156 | 1.256 | -0.293 | 0.77 |
| School 96-7 | **School Is Urban** | 0.95076 | 0.98701 | -0.049 | 0.961 |
| Teacher | **Female** | 1.07354 | 0.10295 | 0.74 | 0.459 |
| Teacher | **First Year Of Teaching Is 1994-95** | 1.63368 | 0.17928 | 4.473 | 0 |
| Teacher | **Novice Teacher, Has 3 Years Or Less Of Total Experience** | 1.07261 | 0.09926 | 0.757 | 0.449 |
| Teacher | **Total Teaching Experience** | 0.97615 | 0.00492 | -4.788 | 0 |
| Teacher | **Age** | 1.36313 | 0.17091 | 2.471 | 0.013 |
| Teacher | **Age Squared** | 0.99315 | 0.00299 | -2.285 | 0.022 |
| Teacher | **Age Cubed** | 1.00005 | 2.3E-05 | 1.973 | 0.049 |
| Teacher | **Teacher Is Credentialed** | 0.72324 | 0.1377 | -1.702 | 0.089 |
| Teacher | **Has A Bachelor's Degree Only** | 0.97059 | 0.0831 | -0.349 | 0.727 |
| Teacher | **Education Level Is A Masters Or Higher** | 1.29264 | 0.08005 | 4.145 | 0 |
| Teacher | **Teacher Is Black** | 0.79628 | 0.14511 | -1.25 | 0.211 |
| Teacher | **Teacher Is Hispanic** | 0.82525 | 0.07556 | -2.098 | 0.036 |
| Teacher | **Teacher Is Asian** | 0.94459 | 0.11349 | -0.474 | 0.635 |
| Teacher | **Teacher Is American Indian** | 0.8575 | 0.28248 | -0.467 | 0.641 |
| Teacher | **Unknown Teacher Ethnicity** | 2.59007 | 1.46062 | 1.688 | 0.091 |

Source: CBEDS PAIF, CCD, CA EDD, CA DoF, BLS

## Part 3: Move Grades Within Schools

This section contains two regressions. Each describes the movement of teachers between K–3 and other groups of grades within the same school. The sample in the first regressions (regression 5) was all K–3 teachers who remained in the same school between 1995-6. The dependent variable is one if a teacher moved out of K–3. The sample is the second regression (regression 6) is all K–3 teachers in 1996-7. Here the dependent variable is one if the teacher was not in K–3 in the prior year (1995–96).

Regression 5: Teachers who remained in the same school
The dependent variable is one if the teacher changed grades. There are 35,740 observations in this sample.

## TABLE 14: VARIABLES IN REGRESSION 5, TEACHERS MOVING GRADES WITHIN THE SAME SCHOOL OUT OF K–3 IN 1995–96

| Level | Variables, Moving Between Grades Within the Same School, Out Of K–3 Between 1995-6 & 1996-7 | Mean | Standard Deviation |
|---|---|---|---|
| Dependent | Changed Grades Between 95 And 9 | .07326 | .26057 |
| County | Population Density In 1995 | 1364.89 | 2171.05 |
| County | Average Unemployment 1995 | 8.29561 | 3.59924 |
| County | Average All Industry Wage 1995 | 28652.5 | 5287.6 |
| County | Average Federal Wage 1995 | 39031.6 | 5273.82 |
| District | Total Schools | 23.6095 | 21.6734 |
| District | Total Schools In District Cubed | 66674.1 | 205027 |
| District | Total Students | 17859 | 16643.3 |
| District | Cubed Total Students In 1995-6 | 2.84E+13 | 8.40E+13 |
| District | Growth Between 1994-95 And 1995-6, Truncated At +/- 10 | 1.14722 | 2.10651 |
| District | Maximum District Salary In 1994-95, Merged With 1995-6 Observations | 51099.2 | 4132.2 |
| District | General Fund Teacher Expenditures Per Student In 1995-6 | 1853.66 | 158.985 |
| District | General Fund Administrative Expenditures Per Student In 1995-6 | 196.174 | 32.3069 |
| School 95-6 | Class Size | 29.2106 | 2.90806 |
| School 95-6 | School Percent Black In 1995-6 | 7.52389 | 10.0959 |
| School 95-6 | School Percent Hispanic In 1995-6 | 36.4643 | 27.3944 |
| School 95-6 | School Percent Asian In 1995-6 | 10.3923 | 12.8401 |
| School 95-6 | School Percent American Indian In 1995-6 | 0.84627 | 2.65068 |
| School 95-6 | School Percent Free Lunch Eligible In 1995-6 | 49.9365 | 28.7572 |
| School 96-7 | Reduced In Teacher's Grade | 0.33437 | 0.47178 |
| School 96-7 | Class Size | 25.7484 | 6.12084 |
| School 95-6 | School Is Rural | 0.04992 | 0.21779 |
| School 95-6 | School Is Urban | 0.30257 | 0.45938 |
| Teacher | Female | 0.92559 | 0.26243 |
| Teacher | First Year Of Teaching Is 1994-95 | 0.04855 | 0.21493 |
| Teacher | Novice Teacher, Has 3 Years Or Less Of Total Experience | 0.14152 | 0.34856 |
| Teacher | Total Teaching Experience | 14.3357 | 9.69202 |
| Teacher | Age | 43.0425 | 10.0197 |
| Teacher | Age Squared | 1953.05 | 857.29 |
| Teacher | Age Cubed | 92583.6 | 58141.1 |
| Teacher | Teacher Is Credentialed | 0.98878 | 0.10534 |
| Teacher | Has A Bachelor's Degree Only | 0.10414 | 0.30545 |
| Teacher | Education Level Is A Masters Or Higher | 0.24803 | 0.43187 |
| Teacher | Teacher Is Black | 0.0296 | 0.16948 |
| Teacher | Teacher Is Hispanic | 0.11608 | 0.32032 |
| Teacher | Teacher Is Asian | 0.05039 | 0.21876 |
| Teacher | Teacher Is American Indian | 0.00572 | 0.07542 |
| Teacher | Unknown Teacher Ethnicity | 0.00091 | 0.03012 |

Source: CBEDS PAIF, CCD, CA EDD, CA DoF, BLS

## TABLE 15: REGRESSION 5 DESCRIPTORS:

| | |
|---|---|
| chi2(36) | 906.16 |
| Prob > chi2 | 0 |
| Pseudo R2 | 0.1335 |

## TABLE 16: ODDS RATIONS FROM REGRESSION 5, TEACHERS MOVING GRADES WITHIN THE SAME SCHOOL, OUT OF K–3 IN 1995–96

| Dependent | Odds Ratios, Moving Between Grades Within the Same School, Out Of K–3 Between 1995-6 & 1996-7 | Odds Ratio | Standard Error | z | P>\|z\| |
|---|---|---|---|---|---|
| County | **Population Density In 1995** | 1.00005 | 2.6E-05 | 2.053 | 0.04 |
| County | **Average Unemployment 1995** | 0.96862 | 0.01138 | -2.715 | 0.007 |
| County | **Average All Industry Wage 1995** | 1 | 9.74E-06 | -0.212 | 0.832 |
| County | **Average Federal Wage 1995** | 0.99999 | 8.44E-06 | -1.103 | 0.27 |
| District | **Total Schools** | 1.0452 | 0.00772 | 5.983 | 0 |
| District | **Total Schools In District Cubed** | 1 | 5.33E-07 | -2.313 | 0.021 |
| District | **Total Students** | 0.99995 | 9.51E-06 | -5.006 | 0 |
| District | **Cubed Total Students In 1995-6** | 1 | 1.06E-15 | 1.157 | 0.247 |
| District | **Growth Between 1994-95 And 1995-6, Truncated At +/- 10** | 0.95468 | 0.01211 | -3.656 | 0 |
| District | **Maximum District Salary In 1994-95, Merged With 1995-6 Observations** | 1.00002 | 8.25E-06 | 2.321 | 0.02 |
| District | **General Fund Teacher Expenditures Per Student In 1995-6** | 0.99986 | 0.00019 | -0.737 | 0.461 |
| District | **General Fund Administrative Expenditures Per Student In 1995-6** | 1.00094 | 0.00094 | 1.001 | 0.317 |
| School 95-6 | **Class Size** | 1.00756 | 0.00965 | 0.787 | 0.431 |
| School 95-6 | **School Percent Black In 1995-6** | 0.99605 | 0.00294 | -1.342 | 0.18 |
| School 95-6 | **School Percent Hispanic In 1995-6** | 1.00131 | 0.00203 | 0.648 | 0.517 |
| School 95-6 | **School Percent Asian In 1995-6** | 0.99581 | 0.00252 | -1.659 | 0.097 |
| School 95-6 | **School Percent American Indian In 1995-6** | 1.00656 | 0.00813 | 0.81 | 0.418 |
| School 95-6 | **School Percent Free Lunch Eligible In 1995-6** | 0.99773 | 0.00181 | -1.252 | 0.21 |
| School 96-7 | **Reduced In Teacher's Grade** | 0.02124 | 0.00498 | -16.443 | 0 |
| School 96-7 | **Class Size** | 1.02251 | 0.00516 | 4.407 | 0 |
| School 95-6 | **School Is Rural** | 1.16795 | 0.18744 | 0.967 | 0.333 |
| School 95-6 | **School Is Urban** | 1.00007 | 0.05894 | 0.001 | 0.999 |
| Teacher | **Female** | 0.3204 | 0.02048 | -17.808 | 0 |
| Teacher | **First Year Of Teaching Is 1994-95** | 1.1185 | 0.12877 | 0.973 | 0.331 |
| Teacher | **Novice Teacher, Has 3 Years Or Less Of Total Experience** | 1.18359 | 0.10818 | 1.844 | 0.065 |
| Teacher | **Total Teaching Experience** | 0.97993 | 0.00402 | -4.938 | 0 |
| Teacher | **Age** | 1.29567 | 0.12833 | 2.615 | 0.009 |
| Teacher | **Age Squared** | 0.994 | 0.00228 | -2.622 | 0.009 |
| Teacher | **Age Cubed** | 1.00004 | 1.7E-05 | 2.587 | 0.01 |
| Teacher | **Teacher Is Credentialed** | 0.98734 | 0.20702 | -0.061 | 0.952 |

| Dependent | Odds Ratios, Moving Between Grades Within the Same School, Out Of K–3 Between 1995-6 & 1996-7 | Odds Ratio | Standard Error | z | P>\|z\| |
|---|---|---|---|---|---|
| Teacher | **Has A Bachelor's Degree Only** | 0.97851 | 0.07712 | -0.276 | 0.783 |
| Teacher | **Education Level Is A Masters Or Higher** | 1.1606 | 0.06459 | 2.676 | 0.007 |
| Teacher | **Teacher Is Black** | 1.42939 | 0.175 | 2.918 | 0.004 |
| Teacher | **Teacher Is Hispanic** | 0.59035 | 0.04979 | -6.249 | 0 |
| Teacher | **Teacher Is Asian** | 0.75648 | 0.09385 | -2.249 | 0.024 |
| Teacher | **Teacher Is American Indian** | 1.31605 | 0.34252 | 1.055 | 0.291 |
| Teacher | **Unknown Teacher Ethnicity** | 0.42091 | 0.45159 | -0.807 | 0.42 |

Source: CBEDS PAIF, CCD, CA EDD, CA DoF, BLS

Regression 6: Teachers who moved into K–3 in 1996-7 from within the same school
The dependent variable is the teacher was not in K–3 in the prior year. There are 36,200 observations in this sample.

## TABLE 17: VARIABLES IN REGRESSION 6, TEACHERS MOVING GRADES WITHIN THE SAME SCHOOL INTO K–3 IN 1996–97

| Level | Variables, Moving Between Grades Within the Same School, Into K–3 Between 1995-6 & 1996-7 | Mean | Standard Deviation |
|---|---|---|---|
| Dependent | **Changed Grades Between 95 And 9** | 0.09009 | 0.28631 |
| County | **Population Density In 1995** | 1364.89 | 2171.05 |
| County | **Average Unemployment 1995** | 8.29561 | 3.59924 |
| County | **Average All Industry Wage 1995** | 28652.5 | 5287.6 |
| County | **Average Federal Wage 1995** | 39031.6 | 5273.82 |
| District | **Total Schools** | 23.6095 | 21.6734 |
| District | **Total Schools In District Cubed** | 66674.1 | 205027 |
| District | **Total Students** | 17859 | 16643.3 |
| District | **Cubed Total Students In 1995-6** | 2.84E+13 | 8.40E+13 |
| District | **Growth Between 1994-95 And 1995-6, Truncated At +/- 10** | 1.14722 | 2.10651 |
| District | **Maximum District Salary In 1994-95, Merged With 1995-6 Observations** | 51099.2 | 4132.2 |
| District | **General Fund Teacher Expenditures Per Student In 1995-6** | 1853.66 | 158.985 |
| District | **General Fund Administrative Expenditures Per Student In 1995-6** | 196.174 | 32.3069 |
| School 95-6 | **Class Size** | 29.2106 | 2.90806 |
| School 95-6 | **School Percent Black In 1995-6** | 7.52389 | 10.0959 |
| School 95-6 | **School Percent Hispanic In 1995-6** | 36.4643 | 27.3944 |
| School 95-6 | **School Percent Asian In 1995-6** | 10.3923 | 12.8401 |
| School 95-6 | **School Percent American Indian In 1995-6** | 0.84627 | 2.65068 |
| School 95-6 | **School Percent Free Lunch Eligible In 1995-6** | 49.9365 | 28.7572 |
| School 96-7 | **Reduced In Teacher's Grade** | 0.33437 | 0.47178 |
| School 96-7 | **Class Size** | 25.7484 | 6.12084 |
| School 95-6 | **School Is Rural** | 0.04992 | 0.21779 |
| School 95-6 | **School Is Urban** | 0.30257 | 0.45938 |
| Teacher | **Female** | 0.92559 | 0.26243 |
| Teacher | **First Year Of Teaching Is 1994-95** | 0.04855 | 0.21493 |
| Teacher | **Novice Teacher, Has 3 Years Or Less Of Total Experience** | 0.14152 | 0.34856 |
| Teacher | **Total Teaching Experience** | 14.3357 | 9.69202 |
| Teacher | **Age** | 43.0425 | 10.0197 |
| Teacher | **Age Squared** | 1953.05 | 857.29 |
| Teacher | **Age Cubed** | 92583.6 | 58141.1 |
| Teacher | **Teacher Is Credentialed** | 0.98878 | 0.10534 |
| Teacher | **Has A Bachelor's Degree Only** | 0.10414 | 0.30545 |
| Teacher | **Education Level Is A Masters Or Higher** | 0.24803 | 0.43187 |
| Teacher | **Teacher Is Black** | 0.0296 | 0.16948 |
| Teacher | **Teacher Is Hispanic** | 0.11608 | 0.32032 |
| Teacher | **Teacher Is Asian** | 0.05039 | 0.21876 |
| Teacher | **Teacher Is American Indian** | 0.00572 | 0.07542 |
| Teacher | **Unknown Teacher Ethnicity** | 0.00091 | 0.03012 |

Source: CBEDS PAIF, CCD, CA EDD, CA DoF, BLS

### TABLE 18: REGRESSION 6 DESCRIPTORS:

| | |
|---|---|
| chi2(36) | 719.48 |
| Prob > chi2 | 0 |
| Pseudo R2 | 0.036 |

### TABLE 19: ODDS RATIOS IN REGRESSION 6, TEACHERS MOVING GRADES WITHIN THE SAME SCHOOL, INTO K–3 IN 1996–97

| Level | Odds Ratios, Moving Between Grades Within the Same School, Into K–3 Between 1995-6 & 1996-7 | Odds Ratio | Standard Error | z | P>\|z\| |
|---|---|---|---|---|---|
| County | **Population Density In 1995** | 1.00005 | 2.2E-05 | 2.004 | 0.045 |
| County | **Average Unemployment 1995** | 0.98843 | 0.00916 | -1.256 | 0.209 |
| County | **Average All Industry Wage 1995** | 1 | 8.33E-06 | -0.096 | 0.924 |
| County | **Average Federal Wage 1995** | 1 | 6.86E-06 | 0.328 | 0.743 |
| District | **Total Schools** | 1.0315 | 0.00709 | 4.509 | 0 |
| District | **Total Schools In District Cubed** | 1 | 4.69E-07 | -1.916 | 0.055 |
| District | **Total Students** | 0.99997 | 8.73E-06 | -3.879 | 0 |
| District | **Cubed Total Students In 1995-6** | 1 | 8.57E-16 | 1.068 | 0.286 |
| District | **Growth Between 1994-95 And 1995-6, Truncated At +/- 10** | 0.97038 | 0.0112 | -2.604 | 0.009 |
| District | **Maximum District Salary In 1994-95, Merged With 1995-6 Observations** | 0.99999 | 7.18E-06 | -1.293 | 0.196 |
| District | **General Fund Teacher Expenditures Per Student In 1995-6** | 1.00001 | 0.00016 | 0.056 | 0.956 |
| District | **General Fund Administrative Expenditures Per Student In 1995-6** | 1.00055 | 0.0008 | 0.69 | 0.49 |
| School 95-6 | **Class Size** | 1.01149 | 0.00238 | 4.85 | 0 |
| School 95-6 | **School Percent Black In 1995-6** | 0.99817 | 0.00247 | -0.742 | 0.458 |
| School 95-6 | **School Percent Hispanic In 1995-6** | 0.99977 | 0.00163 | -0.142 | 0.887 |
| School 95-6 | **School Percent Asian In 1995-6** | 0.99814 | 0.00213 | -0.874 | 0.382 |
| School 95-6 | **School Percent American Indian In 1995-6** | 0.99163 | 0.00829 | -1.005 | 0.315 |
| School 95-6 | **School Percent Free Lunch Eligible In 1995-6** | 1.00046 | 0.00148 | 0.307 | 0.759 |
| School 96-7 | **Reduced In Teacher's Grade** | 0.83498 | 0.07063 | -2.132 | 0.033 |
| School 96-7 | **Class Size** | 1.03454 | 0.00773 | 4.547 | 0 |
| School 95-6 | **School Is Rural** | 1.16754 | 0.13427 | 1.347 | 0.178 |
| School 95-6 | **School Is Urban** | 1.07369 | 0.05531 | 1.38 | 0.168 |
| Teacher | **Female** | 0.34489 | 0.01926 | -19.063 | 0 |
| Teacher | **First Year Of Teaching Is 1994-95** | 1.11523 | 0.12431 | 0.978 | 0.328 |
| Teacher | **Novice Teacher, Has 3 Years Or Less Of Total Experience** | 1.07635 | 0.08865 | 0.893 | 0.372 |
| Teacher | **Total Teaching Experience** | 0.98466 | 0.00344 | -4.424 | 0 |
| Teacher | **Age** | 1.06377 | 0.103 | 0.638 | 0.523 |
| Teacher | **Age Squared** | 0.99888 | 0.00226 | -0.494 | 0.621 |
| Teacher | **Age Cubed** | 1.00001 | 1.7E-05 | 0.327 | 0.744 |
| Teacher | **Teacher Is Credentialed** | 1.31583 | 0.27256 | 1.325 | 0.185 |
| Teacher | **Has A Bachelor's Degree Only** | 0.97338 | 0.06957 | -0.378 | 0.706 |

| Level | Odds Ratios, Moving Between Grades Within the Same School, Into K–3 Between 1995-6 & 1996-7 | Odds Ratio | Standard Error | z | P>\|z\| |
|---|---|---|---|---|---|
| Teacher | **Education Level Is A Masters Or Higher** | 1.13321 | 0.05589 | 2.536 | 0.011 |
| Teacher | **Teacher Is Black** | 1.14627 | 0.13879 | 1.128 | 0.26 |
| Teacher | **Teacher Is Hispanic** | 0.69847 | 0.05184 | -4.835 | 0 |
| Teacher | **Teacher Is Asian** | 0.65507 | 0.07032 | -3.94 | 0 |
| Teacher | **Teacher Is American Indian** | 1.13352 | 0.26389 | 0.538 | 0.59 |
| Teacher | **Unknown Teacher Ethnicity** | 0.70587 | 0.53436 | -0.46 | 0.645 |

Source: CBEDS PAIF, CCD, CA EDD, CA DoF, BLS

## Part 4: New Teachers

This section contains two regressions that were used to describe teachers who were new to districts in 1996-7. The sample was the same in each regression. The dependent variable in the first regression is whether a new teacher is not fully credentialed (Regression 7). The dependent variable in the second is whether a new teacher has education is a bachelor's degree only (Regression 8). The only difference between the independent variables in the two regressions is the use of education as an independent variable in the regression (7) where credentialing is the dependent variable, and credential status as an independent variable in the regression (8) where education is the dependent variable. There are 10,514 observations in each of the regressions.

Regression 7: Credential status of new teachers.

The dependent variable in this regression is one if the teacher is not fully credentialed.

## TABLE 20: VARIABLES IN REGRESSION 7, CREDENTIAL STATUS OF NEW K–3 TEACHERS IN 1996–97

| Level | Variables In The New Teacher Credentialing Regression | Mean | Standard Deviation |
|---|---|---|---|
| Dependent | **Teacher Is Not Fully Credentialed** | 0.1655887 | 0.3717287 |
| County | **Population Density In 1996** | 1421.263 | 1848.719 |
| County | **Average Unemployment 1996** | 7.36342 | 3.464162 |
| County | **Average All Industry Wage 1996** | 29886.8 | 5600.23 |
| County | **Average Federal Wage 1996** | 40800.86 | 4914.161 |
| District | **Total Students** | 18715.55 | 18108.81 |
| District | **Cubed Total Students In 1996–97** | 3.57E+13 | 1.08E+14 |
| District | **Total Schools** | 23.79484 | 21.3787 |
| District | **Total Schools In District Cubed** | 64567.3 | 189886.8 |
| District | **Growth Between 1995–96 And 1996–97, Truncated At +/- 10** | 1.35895 | 2.259897 |
| District | **Minimum District Salary** | 25802.74 | 2099.297 |
| District | **General Fund Teacher Expenditures Per Student In 1995–96** | 2035.469 | 177.276 |
| District | **General Fund Teacher Expenditures Per Student In 1996–97** | 208.3223 | 33.23825 |
| School 96-7 | **Total Students** | 18715.55 | 18108.81 |
| School 96-7 | **Total Students In School Cubed** | 4.34E+08 | 4.94E+08 |
| School 96-7 | **School Percent Black In 1996–97** | 8.139338 | 10.9212 |
| School 96-7 | **School Percent Hispanic in 1996–97** | 39.23502 | 28.38828 |
| School 96-7 | **School Percent Asian In 1996–97** | 9.737112 | 12.01967 |
| School 96-7 | **School Percent American Indian In 1995–96** | 0.7346395 | 1.95419 |
| School 96-7 | **Percent Free Lunch Eligible Students In The School** | 52.03348 | 30.05465 |
| School 96-7 | **Class Size** | 23.16226 | 5.361871 |
| School 96-7 | **School Is Rural** | 0.041849 | 0.2002534 |
| School 96-7 | **School Is Urban** | 0.2848583 | 0.4513684 |
| School 96-7 | **Reduced In Teacher's Grade** | 0.5430854 | 0.4981639 |
| School 96-7 | **Reduced Grade Interacted With Percent Hispanic Students** | 18.41697 | 25.9587 |
| School 96-7 | **Reduced Grade Interacted With Percent Asian Students** | 5.388434 | 10.07568 |
| School 96-7 | **Reduced Grade Interacted With School Percent American Indian** | 0.4250523 | 1.428849 |
| School 96-7 | **Reduced Grade Interacted With Percent Black Students** | 4.134297 | 8.450112 |
| School 96-7 | **Reduced Grade Interacted With School Percent Free And Reduced Lunch** | 26.02939 | 32.53968 |
| Teacher | **Female** | 0.902606 | 0.2965076 |
| Teacher | **New To Teaching In 1996–97** | 0.5645806 | 0.4958354 |
| Teacher | **Novice Teacher, Has 3 Years Or Less Of Total Experience** | 0.7121933 | 0.4527621 |
| Teacher | **Total Teaching Experience** | 4.014742 | 5.898123 |
| Teacher | **Total Experience Cubed** | 1072.903 | 5020.89 |
| Teacher | **Age** | 34.39557 | 9.658459 |
| Teacher | **Age Cubed** | 51030.66 | 46225.13 |

| Level | Variables In The New Teacher Credentialing Regression | Mean | Standard Deviation |
|---|---|---|---|
| Teacher | **Education Less Than BA** | 0.323093 | 0.4676802 |
| Teacher | **Education At Masters Or Higher** | 0.130778 | 0.3371734 |
| Teacher | **Teacher Is Asian** | 0.0524063 | 0.2228556 |
| Teacher | **Teacher Is Black** | 0.0329085 | 0.1784056 |
| Teacher | **Teacher Is Hispanic** | 0.1619745 | 0.3684449 |
| Teacher | **Teacher Is American Indian** | 0.0054213 | 0.0734334 |
| Teacher | **Unknown Teacher Ethnicity** | 0.0041849 | 0.0645583 |

Source: CBEDS PAIF, CCD, CA EDD, CA DoF, BLS

## TABLE 21: REGRESSION 22 DESCRIPTORS:

| | |
|---|---|
| chi2(36) | 1374.31 |
| Prob > chi2 | 0 |
| Pseudo R2 | 0.3163 |

## TABLE 22: ODDS RATIOS IN REGRESSION 7, CREDENTIAL STATUS OF NEW K–3 TEACHERS IN 1996–97

| Level | Odds Ratios In The New Teacher Credentialing Regression | Odds Ratio | Standard Error | z | P>\|z\| |
|---|---|---|---|---|---|
| County | **Population Density In 1996** | 1.00002 | 4.9E-05 | 0.441 | 0.659 |
| County | **Average Unemployment 1996** | 1.01354 | 0.01846 | 0.738 | 0.46 |
| County | **Average All Industry Wage 1996** | 0.99997 | 1.7E-05 | -1.538 | 0.124 |
| District | **Average Federal Wage 1996** | 1.00006 | 1.4E-05 | 4.23 | 0 |
| District | **Total Students** | 1.00005 | 1.6E-05 | 3.144 | 0.002 |
| District | **Cubed Total Students In 1996–97** | 1 | 1.27E-15 | -0.297 | 0.766 |
| District | **Total Schools** | 0.95972 | 0.0134 | -2.944 | 0.003 |
| District | **Total Schools In District Cubed** | 1 | 9.72E-07 | 1.218 | 0.223 |
| District | **Growth Between 1995–96 And 1996–97, Truncated At +/- 10** | 0.97508 | 0.02178 | -1.13 | 0.259 |
| District | **Minimum District Salary** | 1.00007 | 2.2E-05 | 3.162 | 0.002 |
| District | **General Fund Teacher Expenditures Per Student In 1995–96** | 0.99916 | 0.00031 | -2.729 | 0.006 |
| School 96-7 | **General Fund Teacher Expenditures Per Student In 1996–97** | 1.00057 | 0.00156 | 0.366 | 0.714 |
| School 96-7 | **Total Students** | 0.9996 | 0.00044 | -0.912 | 0.362 |
| School 96-7 | **Total Students In School Cubed** | 1 | 1.67E-10 | 0.569 | 0.569 |
| School 96-7 | **School Percent Black In 1996–97** | 1.01767 | 0.00555 | 3.209 | 0.001 |
| School 96-7 | **School Percent Hispanic in 1996–97** | 1.01963 | 0.00399 | 4.97 | 0 |
| School 96-7 | **School Percent Asian In 1996–97** | 0.98655 | 0.00635 | -2.102 | 0.036 |
| School 96-7 | **School Percent American Indian In 1995–96** | 0.92864 | 0.0541 | -1.271 | 0.204 |
| School 96-7 | **Percent Free Lunch Eligible Students In The School** | 0.99834 | 0.00352 | -0.471 | 0.638 |
| School 96-7 | **Class Size** | 0.97576 | 0.00957 | -2.5 | 0.012 |
| School 96-7 | **School Is Rural** | 0.67154 | 0.20142 | -1.328 | 0.184 |
| School 96-7 | **School Is Urban** | 0.9776 | 0.1085 | -0.204 | 0.838 |
| School 96-7 | **Reduced In Teacher's Grade** | 0.61785 | 0.13991 | -2.126 | 0.033 |
| School 96-7 | **Reduced Grade Interacted With Percent Hispanic Students** | 0.99854 | 0.00468 | -0.312 | 0.755 |
| School 96-7 | **Reduced Grade Interacted With Percent Asian Students** | 1.01851 | 0.00775 | 2.412 | 0.016 |
| School 96-7 | **Reduced Grade Interacted With School Percent American Indian** | 1.09485 | 0.07399 | 1.341 | 0.18 |
| School 96-7 | **Reduced Grade Interacted With Percent Black Students** | 1.00554 | 0.00766 | 0.725 | 0.468 |
| Teacher | **Reduced Grade Interacted With School Percent Free And Reduced Lunch** | 1.0032 | 0.0045 | 0.712 | 0.476 |

| Level | Odds Ratios In The New Teacher Credentialing Regression | Odds Ratio | Standard Error | z | P>\|z\| |
|---|---|---|---|---|---|
| Teacher | **Female** | 0.67899 | 0.06133 | -4.286 | 0 |
| Teacher | **New To District In 1996–97** | 2.23826 | 0.24619 | 7.325 | 0 |
| Teacher | **Novice Teacher, Has 3 Years Or Less Of Total Experience** | 1.47866 | 0.29997 | 1.928 | 0.054 |
| Teacher | **Total Teaching Experience** | 0.95672 | 0.03116 | -1.358 | 0.174 |
| Teacher | **Total Experience Cubed** | 0.99998 | 3.7E-05 | -0.525 | 0.599 |
| Teacher | **Age** | 1.05189 | 0.01766 | 3.013 | 0.003 |
| Teacher | **Age Cubed** | 0.99999 | 3.96E-06 | -3.088 | 0.002 |
| Teacher | **Education Less Than BA** | 5.50374 | 0.41105 | 22.835 | 0 |
| Teacher | **Education At Masters Or Higher** | 1.62005 | 0.20853 | 3.748 | 0 |
| Teacher | **Teacher Is Asian** | 1.22251 | 0.17517 | 1.402 | 0.161 |
| Teacher | **Teacher Is Black** | 2.59813 | 0.45602 | 5.44 | 0 |
| Teacher | **Teacher Is Hispanic** | 1.94994 | 0.17163 | 7.587 | 0 |
| Teacher | **Teacher Is American Indian** | 0.96843 | 0.47228 | -0.066 | 0.948 |
| Teacher | **Unknown Teacher Ethnicity** | 1.11582 | 0.46995 | 0.26 | 0.795 |

Source: CBEDS PAIF, CCD, CA EDD, CA DoF, BLS

Regression 8: Education level of new teachers

The dependent variable is one if the teacher's education level is only a bachelor's degree.

## TABLE 23: VARIABLES IN REGRESSION 8, EDUCATION LEVEL OF NEW K–3 TEACHERS IN 1996–97

| Level | Variables In The New Teacher Bachelor's Degree Only Regression | Mean | Standard Deviation |
|---|---|---|---|
| Dependent | **Education Above A Bachelors** | 0.323093 | 0.4676802 |
| County | **Population Density In 1996** | 1421.263 | 1848.719 |
| County | **Average Unemployment 1996** | 7.36342 | 3.464162 |
| County | **Average All Industry Wage 1996** | 29886.8 | 5600.23 |
| County | **Average Federal Wage 1996** | 40800.86 | 4914.161 |
| District | **Total Students** | 18715.55 | 18108.81 |
| District | **Cubed Total Students In 1996–97** | 3.57E+13 | 1.08E+14 |
| District | **Total Schools** | 23.79484 | 21.3787 |
| District | **Total Schools In District Cubed** | 64567.3 | 189886.8 |
| District | **Growth Between 1995–96 And 1996–97, Truncated At +/- 10** | 1.35895 | 2.259897 |
| District | **Minimum District Salary** | 25802.74 | 2099.297 |
| District | **General Fund Teacher Expenditures Per Student In 1995–96** | 2035.469 | 177.276 |
| District | **General Fund Teacher Expenditures Per Student In 1996–97** | 208.3223 | 33.23825 |
| School 96-7 | **Total Students** | 18715.55 | 18108.81 |
| School 96-7 | **Total Students In School Cubed** | 4.34E+08 | 4.94E+08 |
| School 96-7 | **School Percent Black In 1996–97** | 8.139338 | 10.9212 |
| School 96-7 | **School Percent Hispanic in 1996–97** | 39.23502 | 28.38828 |
| School 96-7 | **School Percent Asian In 1996–97** | 9.737112 | 12.01967 |
| School 96-7 | **School Percent American Indian In 1995–96** | 0.7346395 | 1.95419 |
| School 96-7 | **Percent Free Lunch Eligible Students In The School** | 52.03348 | 30.05465 |
| School 96-7 | **Class Size** | 23.16226 | 5.361871 |
| School 96-7 | **School Is Rural** | 0.041849 | 0.2002534 |
| School 96-7 | **School Is Urban** | 0.2848583 | 0.4513684 |
| School 96-7 | **Reduced In Teacher's Grade** | 0.5430854 | 0.4981639 |
| School 96-7 | **Reduced Grade Interacted With Percent Hispanic Students** | 18.41697 | 25.9587 |
| School 96-7 | **Reduced Grade Interacted With Percent Asian Students** | 5.388434 | 10.07568 |
| School 96-7 | **Reduced Grade Interacted With School Percent American Indian** | 0.4250523 | 1.428849 |
| School 96-7 | **Reduced Grade Interacted With Percent Black Students** | 4.134297 | 8.450112 |
| School 96-7 | **Reduced Grade Interacted With School Percent Free And Reduced Lunch** | 26.02939 | 32.53968 |
| Teacher | **Female** | 0.902606 | 0.2965076 |
| Teacher | **New To District In 1996–97** | 0.5645806 | 0.4958354 |
| Teacher | **Novice Teacher, Has 3 Years Or Less Of Total Experience** | 0.7121933 | 0.4527621 |
| Teacher | **Total Teaching Experience** | 4.014742 | 5.898123 |
| Teacher | **Total Experience Cubed** | 1072.903 | 5020.89 |
| Teacher | **Age** | 34.39557 | 9.658459 |
| Teacher | **Age Cubed** | 51030.66 | 46225.13 |

| Level | Variables In The New Teacher Bachelor's Degree Only Regression | Mean | Standard Deviation |
|---|---|---|---|
| Teacher | **Teacher Is Credentialed** | 0.8344113 | 0.3717287 |
| Teacher | **Teacher Is Asian** | 0.0524063 | 0.2228556 |
| Teacher | **Teacher Is Black** | 0.0329085 | 0.1784056 |
| Teacher | **Teacher Is Hispanic** | 0.1619745 | 0.3684449 |
| Teacher | **Teacher Is American Indian** | 0.0054213 | 0.0734334 |
| Teacher | **Unknown Teacher Ethnicity** | 0.0041849 | 0.0645583 |
| Teacher | | | |

Source: CBEDS PAIF, CCD, CA EDD, CA DoF, BLS

### TABLE 24: REGRESSION 7 DESCRIPTORS:

| | |
|---|---|
| chi2(36) | 1515.43 |
| Prob > chi2 | 0 |
| Pseudo R2 | 0.1832 |

### TABLE 25: ODDS RATIOS IN REGRESSION 7, CREDENTIAL STATUS OF NEW K–3 TEACHERS IN 1996–97

| Level | Odds Ratios In The New Teacher Bachelor's Degree only Regression | Odds Ratio | Standard Error | z | P>\|z\| |
|---|---|---|---|---|---|
| County | Population Density In 1996 | 0.99995 | 3.3E-05 | -1.535 | 0.125 |
| County | Average Unemployment 1996 | 1.01649 | 0.01115 | 1.491 | 0.136 |
| County | Average All Industry Wage 1996 | 1 | 1.1E-05 | 0.182 | 0.855 |
| District | Average Federal Wage 1996 | 1.00001 | 8.73E-06 | 1.558 | 0.119 |
| District | Total Students | 0.99997 | 1.1E-05 | -2.632 | 0.008 |
| District | Cubed Total Students In 1996–97 | 1 | 9.24E-16 | 2.048 | 0.041 |
| District | Total Schools | 1.03784 | 0.01024 | 3.764 | 0 |
| District | Total Schools In District Cubed | 1 | 6.87E-07 | -2.352 | 0.019 |
| District | Growth Between 1995–96 And 1996–97, Truncated At +/- 10 | 0.995 | 0.01459 | -0.342 | 0.733 |
| District | Minimum District Salary | 1 | 1.5E-05 | 0.177 | 0.859 |
| District | General Fund Teacher Expenditures Per Student In 1995–96 | 0.99877 | 0.00021 | -5.882 | 0 |
| School 96-7 | General Fund Teacher Expenditures Per Student In 1996–97 | 1.00086 | 0.00106 | 0.81 | 0.418 |
| School 96-7 | Total Students | 0.9997 | 0.00028 | -1.059 | 0.29 |
| School 96-7 | Total Students In School Cubed | 1 | 1.22E-10 | 0.475 | 0.635 |
| School 96-7 | School Percent Black In 1996–97 | 1.0081 | 0.00529 | 1.539 | 0.124 |
| School 96-7 | School Percent Hispanic in 1996–97 | 1.0048 | 0.00299 | 1.607 | 0.108 |
| School 96-7 | School Percent Asian In 1996–97 | 1.01359 | 0.004 | 3.418 | 0.001 |
| School 96-7 | School Percent American Indian In 1995–96 | 1.01753 | 0.02351 | 0.752 | 0.452 |
| School 96-7 | Percent Free Lunch Eligible Students In The School | 0.99782 | 0.00275 | -0.793 | 0.428 |
| School 96-7 | Class Size | 0.9867 | 0.00803 | -1.646 | 0.1 |
| School 96-7 | School Is Rural | 0.83156 | 0.1452 | -1.056 | 0.291 |
| School 96-7 | School Is Urban | 0.87594 | 0.06231 | -1.862 | 0.063 |
| School 96-7 | Reduced In Teacher's Grade | 0.94891 | 0.14539 | -0.342 | 0.732 |
| School 96-7 | Reduced Grade Interacted With Percent Hispanic Students | 1.00232 | 0.00357 | 0.651 | 0.515 |
| School 96-7 | Reduced Grade Interacted With Percent Asian Students | 0.98969 | 0.0045 | -2.28 | 0.023 |
| School 96-7 | Reduced Grade Interacted With School Percent American Indian | 0.95109 | 0.03916 | -1.218 | 0.223 |
| School 96-7 | Reduced Grade Interacted With Percent Black Students | 1.00345 | 0.00633 | 0.547 | 0.585 |
| School 96-7s | Reduced Grade Interacted With School Percent Free And Reduced Lunch | 0.99642 | 0.00335 | -1.065 | 0.287 |
| Teacher | Female | 0.96043 | 0.07596 | -0.51 | 0.61 |

| Level | Odds Ratios In The New Teacher Bachelor's Degree only Regression | Odds Ratio | Standard Error | z | P>\|z\| |
|---|---|---|---|---|---|
| Teacher | New To District In 1996–97 | 1.47993 | 0.11077 | 5.237 | 0 |
| Teacher | Novice Teacher, Has 3 Years Or Less Of Total Experience | 0.98867 | 0.12082 | -0.093 | 0.926 |
| Teacher | Total Teaching Experience | 0.92845 | 0.0185 | -3.727 | 0 |
| Teacher | Total Experience Cubed | 0.99997 | 2.5E-05 | -1.063 | 0.288 |
| Teacher | Age | 0.8835 | 0.01029 | -10.633 | 0 |
| Teacher | Age Cubed | 1.00003 | 2.61E-06 | 9.47 | 0 |
| Teacher | Teacher Is Credentialed | 0.19002 | 0.01333 | -23.68 | 0 |
| Teacher | Teacher Is Asian | 0.67334 | 0.07491 | -3.555 | 0 |
| Teacher | Teacher Is Black | 1.3838 | 0.22313 | 2.015 | 0.044 |
| Teacher | Teacher Is Hispanic | 1.28095 | 0.09148 | 3.467 | 0.001 |
| Teacher | Teacher Is American Indian | 1.30709 | 0.44469 | 0.787 | 0.431 |
| Teacher | Unknown Teacher Ethnicity | 0.76082 | 0.27975 | -0.743 | 0.457 |

Source: CBEDS PAIF, CCD, CA EDD, CA DoF, BLS

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